Journal by Alexander Graham Bell, From July 19, 1901, to August 31, 1901

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1

1901, July 19 Friday At Beinn Bhreagh.

Arrived here Wednesday, July 17. Present at Beinn Bhreagh: — Mr. and Mrs. A. M. Bell, Mr. and Mrs. A. G. Bell, Mr. and Mrs. Gilbert H. Grosvenor, Miss Marian H. Graham Bell, Miss Robbie Ker, Miss Bessie A. Safford, Mr. Edwin P. Grosvenor.

In the kitchen department Maggie Campbell, Mary and a new girl, Charles Thompson and a new colored man, (Charles' cousin)

A new gardner in the gardner's cottage, a Mr. Davidson, of Boston, originally from Aberdeenshire.

Elsewhere: — New men all around. Don't know their names. The only old faces are Mr. Angus McInnis, and Rorrie. Of course there is Dan McInnis, who is as small as ever, John

McKillop at the mountain with his wife and two children, a new girl baby since I was here last. Among the men on the place is Archie and a nice looking boy from near Baddeck to help the gardner.

Everyone excepting my father and myself, left yesterday even for the other side of the bay to attend a reception given to Elsie by the Young Ladies Club of Baddeck., at the residence of Mrs. D.F. McRae. Mrs. A. M. Bell returned from the warehouse as she was afraid to go in the boat with so many in it.

2

2 Last night looked over a few of the weather maps for July. Think it would be well to ask Prof. Willis Moore for the dew-point temperatures during this whole heated spell.

Want to have the laboratory annex cleaned up and put in order so that I can go there. Want Miss Safford to collect and put on my table there the July weather maps for the last few years so that I can study there the weather conditions which have existed this month comparatively with those of a similar period in past years.

THOUGHT.

Express the elements of the weather by shaded areas instead of by lines of equal temperature, pressure, &c. Then, if a succession of weather maps should be photographed on a celluloid film used for moving pictures, and projected upon the screne, we should SEE the weather changing. We might note the advance of a hot wave and all the other points correlated with it. — A MOVING WEATHER MAP — might prove to be a new means of studying meteorology. I believe we could trace CORRELATED CONDITIONS in a way that would be impossible otherwise.

THOUGHT.

A moving map showing the shadow of night creeping over the continent would be a most instructive thing, more useful, perhaps than the picture of a globe turning in the sunlight. In such a moving picture we would have the shaded portion constant and the world turning — so that we would see known places upon the earth 3 3 moving into the shadow of the night. We would see the world as it would look from a distance in space. But this is not related to our own experiences. To our senses the world is at rest, and the days and nights move over the surface. I think, therefore, that a moving picture representing the world — or the United States — (the same thing perhaps!) at rest, and a shadow creeping over it from right to left would be more useful. Then night would cover the whole continent until a strip of sun rise would appear on the eastern edge and the shadow then gradually pass off to the left leaving the continent in day.

THOUGHT.

SYMBOLICAL MOVING PICTURES. Just as in composite photography it is not necessary that natural objects alone should be photographed — a composite of graphical symbols of any sort being possible — so, speaking abstractly, if we represent any series of facts by arbitrary, but graphical symbols, then a rapid succession of photographs projected upon the same screen would cause these symbols apparently to move — they would grow longer or shorter, thicker or more slender; they would become darker or gradually fade away in accordance with the graphical principle of symbolization. I am inclined to think that we may have here a new method of scientific research specially adapted for the examination of complicated cases where correlated conditions are found.

4

4 What would be advisable in such a case would be to prepare a series of cards which could be photographed, and the photographs be projected successively on the same screen with considerable rapidity.

Upon each card let a place be assigned for each kind of fact symbolized, so that successive observations of the same facts should appear upon the same part of the card. Then, let a graphical principle be adopted in the symbolization. For example, let increasing quantity be represented by a visible increase of some sort. If your symbol is a line it may be made longer proportionately to the increase of quantity. If it is an area it may be made darker according to a pre-arranged scale of shading. Or the area or lines may be made to increase in thickness and extent. For example, a small shaded circular area having its center at the point of the card designated for that fact may be made larger or smaller in accordance with the quantity to be noted. For example: — Let the quantity successively increase. Then the effect in the symbolical moving picture would be that of a circular shaded area expanding before the eye and growing larger, &c.

Think there is an important idea here. I understand it, but I fear that it may not be so expressed as to be intelligible to others. However, this dictation is for me and not for others. A.G.B.

5

1901, July 20, Saturday At Beinn Bhreagh.

Looked over Science last night for July 12, 1901. George B. Pegrum (pp. 53–59) gives a summary of our knowledge relating to radio-active bodies, and their radiations. Some points are new to me.

Radium salt insulated by being covered with a thin film of wax becomes highly charged with positive electricity. (No references are given in the article, and this very much interferes with its value)

A discovery attributed to Lord Kelvin is of interest. Connect together a plate of zinc and a plate of copper placed face to face, as in a battery, but with an air space between, then

the moment that air space is exposed to the radiations from a uranium salt a current of electricity traverses the connecting wire.

The generic name of Becquerel rays is given for the radiations from uranium and thorium, and the new substances polonium, radium and actinium. Radium is now believed to be a new element, having a characteristic spectrum of its own, but chemists have not decided in relation to polonium and actinium. The concensus of opinion seems to point to the conclusion that the Becquerel rays are emanations of some sort given off by the salts. — material particles of the order of magnitude of odoriferous particles given off by musk and other substances. To my mind this is far from conclusive for the velocity of these supposed particles is about half that of the velocity of light; and it is calculated that the loss of weight by radiation from one square centimeter of surface would be equivalent to one milligram in a thousand million years. Can these radiations consist of material particles. I very much 6 2 doubt it.

On p. 63 occurs a review of a book “Les Problemes de la vie” by Dr. Hermanno Giglio-Tos of Turin (1900) One of the chief functions of a living organism is the assimilation of food and the production from that food of new living cells. Assimilation and growth have hitherto been supposed to belong only to the substance protoplasm. Dr. Giglio- Tos shows that in certain chemical reactions an analogous process goes on. Acetic acid supplied with suitable chemical food — substances containing among other things the elements that go to make up Acetic acid, but not acetic acid itself — assimilates these substances and produces, among other products more acetic acid. He shows that two molecules of acetic acid become four molecules (growth) and that bi-products are produced (excreta). A most interesting and suggestive subject. I have written to order the book.

p. 79. Lord Rayleigh directs attention to an experiment by Heydweiller in which he claims that in certain cases chemical action is accompanied by a minute but real alteration of weight (cupric-sulphide dissolved in water). A.G.B.

1901, July 22, Monday At Beinn Bhreagh.

Married ladies luncheon at Mrs. Kennan's Saturday. Went down to the laboratory Saturday with my father. Tried the old Beinn Bhreagh Challenger kite, a beauty, and no mistake — of triangular form, with cross braces, flew perfectly steadily with string attached to middle of first cell, and also attached to nose.

Watched my father fishing on the warehouse wharf. He caught fifteen perches. The eagles screamed when they saw him coming, evidently recognizing that his appearance meant fish. He had enough to give three to each eagle and three to the bear. How many eagles and how many bears!

Find myself very weak — almost unable to walk. Need exercise — and an object. Kites are just the thing — they keep me in the open air and involve a little exercise. There are several interesting questions I can work at with the assistance of a carpenter, Mr. Ferguson.

(1) Must investigate the conditions of flight with one-celled kites. I remember that I had to leave Beinn Bhreagh for Washington almost immediately after the discovery that one-celled kites would remain steadily in the air when the string was attached to a fixed point far out in advance of the kite. A horizontal stick about a yard in length was attached to the cell projecting in front; then with the string attached closely to the cell the thing whirlled round and round like a windmill. As the string was attached to points further and further away from the cell the rotation became slower and then changed to a pendulous motion. The kite vibrated like a pendulum. Upon making the point of attachment still further forward the vibrations became slower and at a certain distance in front of the kite the vibrations ceased and the kite flew steadily at least up to the horizontal. The further forward the string was attached the more steady was the flight. My recollection of the concluding experiments is that with the string attached to a rigid 8 2 point very far in advance of

the cell, steady hovering was obtained with kites of very many different forms, and the impression made upon my mind by the series of experiments was this: —

That with a long stick having the string attached at one end and the kite at the other — ANYTHING WOULD FLY — at least up to the horizontal.

The experiments were made by flying the kites from the top of the flag pole near the laboratory; and under the last condition named all the forms of kite tried flew steadily with the string extending horizontally from the top of the flag pole. I have had a feeling ever since that the conditions of flight of one-celled kites should be carefully studied and the results published.

(2) The experiments I made in sailing boats by means of kites instead of sails should be further pushed and the results published. The boat could be steered so as to pursue a direction almost at right angles to the pull of the string giving us an angle of steerage almost equal to 180°.

Since making these experiments I discovered that it was possible to make a Hargrave kite fly off the wind to one side or the other at will. By flying the kite with two strings instead of one and holding the strings in the hands like a pair of reins you could guide the kite so that it would fly to one side or the other of the wind. Each string was attached to one side of the kite in the middle of the front cell. If both strings were equally long the kite flew with the wind. If the left — hand string was loosened so as to fly by the right hand string alone the kite flew off to the left so that the string made an angle with the direction of the wind of about 25°. By holding on to the left hand string and releasing the right hand string the kite would fly to the right, so that the string again made an angle of about 25° with the wind on the other side. In this way — with the same wind the kite could be made to fly to the right or the left so that the extreme angled made by the strings between the left and the right positions was about 50° — 25° on either side of the wind.

It therefore became obvious that with the ability to make the kite fly 25° off the wind on either side, and with the ability to steer a boat almost at right angles to the pull of the string it should be possible to make a boat tack up against the wind with a kite as well as a sail. This has only been perceived as a demonstrated possibility. Why not do it and publish the results.

(3) There are two points that it would be advisable to settle before trying the experiments. 9 3

(a) How to make a kite fly off the wind with definiteness and precision. It often happened in former experiments that the kite would fly too far off the wind and be unable to support itself so that it would come down.

(b) How to make a kite that will float upon the water if it should come down, so as to be easily recovered. In former experiments although the wooden frame-work of a kite would float, the cloth becoming water-logged would sink, so that the kite would either sink out of sight or float with a small portion nfxit above water. If we try to recover a submerged kite by pulling on the string we get into difficulties at once. The kite flys upside down under water, and the more you pull the deeper it goes — at least that is the feeling when you become exasperated with the conduct of the kite, and when at last you do recover it you can make no further experiments with it that day.

A FEW THOUGHTS UPON KITES.

Umbrella ribs are now made of tin instead of whalebone. Tin ribs of this sort would form an admirable framework for kites.

The cellular typeof kite is not well adapted for storage on board of a boat. It would be much better if a fan shaped kite could be adopted for sailing a boat that could be folded up like a fan and stored away. In this connection I am much struck by the steadiness of the Japanese fan shaped kite. Perhaps a one-celled kite of this kind may fly well with the

string attached in front of the kite on a fixed point. If such a kite would fly bamboo rods would be just the thing of which to make the supporting ribs. I have bamboo rods about fifteen feet long. Three or four of these radiating from a center like a fan would support an enormous sail area fit to tow a man-of-war — but they wouldn't float well. Inclined to think that for large kites for sailing purposes metal 10 4 ribs would be better consisting of pipes of large diameter and quite thin metal. They would be much lighter than wood, and would float well in the water if hermetically sealed.

DISTILLATION OF WATER FROM THE SEA.

Encyclopedia Brittanica has an article entitled “Distillation” which contains a chapter upon the distillation of water, and the forms of apparatus used in the British Navy and on ocean steamships for condensing drinking water from the sea. “In Dr. Normandy's apparatus the combustion of one pound of coal yields from 14 to 20 pounds of potable water. The apparatus is extensively adopted in the British Navy, the Cunard Line, and many other important emigrant and merchantile lines” “Chaplin's apparatus has been adopted by many important British and continental shipping companies, among others by the Peninsula and Oriental, the Inman, the North German-Lloyd, and the Hamburg-American Companies”.

Why not write to these companies for information.

Taking Dr. Normandy's figures as a basis and the price of coal at $5 a ton (of 2 000 lbs) which gives us 4 lbs. of coal for one cent, we find that one cent's worth of fuel (4 lbs.) should yield from 56 to 80 lbs. of potable water.

A gallon of water weighs 8.3389 lbs. and occupies 231 cu.in. of space.

One cent's worth of coal (4 lbs.) should yield between 7 and 10 gallons of drinkable water.

5 Chaplin's apparatus is much simpler than Normandy's, but no figures are given an owing the amount of water distilled for each pound of coal: —

“The apparatus possesses the great merit of simplicity and compactness, in consequence of which it is comparatively cheap and not liable to derangement” “After passing through the filter placed directly under the condenser, the areated water is delivered, or stored, ready for use, clear, bright, colorless, pallatable, and devoid of odor, at a temperature of about 15° C.”

A.G.B.

P.S. The ideal kite is not the form best adapted for towing a boat, for its pull would be vertical. For towing purposes the horizontal component in the pull should be large — the vertical element small. A.G.B.

12

1 1901, July 23 Tuesday At Beinn Bhreagh

Yesterday there was a good wind from the direction of the Grand Narrows (- SSW -?) and as nobody was using our center-board sail boat (The Jallan, Jay Booy) I tried sailing her with a kite instead of a sail. We used a good strong Hargrave kite covered with red cotton cloth, and about a hundred meters of cord. The cord proved to be too short for the kite flew so nearly overhead that the horizontal component of its pull was small. Nevertheless we made good speed across the bay from the warehouse wharf, sailing at a large angle (nearly 90° to the wind). Mr. Edwin Grosvenor sat on the front seat and held the reel to which the kite was attached between his knees pretty low down in the boat, Rorie McLeod was also with us. The centerboard was put down and the boat answered its helm well.

Sailing for some time almost at right angles to the wind, we made considerable headway, and I could not perceive any drift. We then headed for Crescent Grove bathing house, and the boat went to it truly without drifting. When we reached shallow water we turned round,

the boat answering her helm perfectly, and aimed for the Lodge wharf on the other side, or rather for the McCurdy boathouse a little way below the wharf. Upon nearing the shore we again tacked for the other side of the bay for a point half way between Mr. Carruth's house and Mr. McCurdy's — no perceptible drift. Nearing the shore we again tacked, and made for the point of the Lodge 13 2 Harbor.

Not knowing exactly how to lower our sails, I attached the kite reel to an iron anchor intending, should any emergence occur to throw the anchor overboard and let the kite anchor itself. However, experiments on steering seemed to assure us that by steering at right angles to the pull of the string — or even a little more than right angles — the headway would so much reduced that we might land anywhere without releasing the kite and without danger to the boat.

We made a landing in this way on the point of the harbor Rorie McLeod lay upon his cars ready to reduce the headway of the boat if necessary. We were being pulled along by the kite at a pretty good rate of speed and when near the shore I steered the boat round at an angle of about 95 or 100° to the pull of the string — at least a little more than right angles — the headway was sufficient to carry us gently on to the shore, and it was not necessary for Rorie to use his oars at all.

Mr. Edwin Grosvenor stepped shore with the kite reel, and we took the kite down upon the land. I was very much pleased with the way that we landed because hitherto there has been a little difficulty in my mind as to how to manoeuvre the boat on landing without taking down the kite or anchoring it overboard. A.G.B.

14

1901, July 24 Wednesday At Beinn Bhreagh

Spent yesterday afternoon up the mountain examining sheep. Much disturbed about their condition, and fear I must look round for another shepherd. I have been surprised at the low weight of the whole flock, and when I come to look at the older sheep they appear

to be in very poor condition with evidences of disease among them. I noticed several sheep coughing very badly, and they had not been separated from the others or given any special care.

One sheep, 702, was missing, and John McKillop said that she was ill in the pasture and he thought she would die. She died while I was on the mountain, so I had John McKillop open the body so that we might find the cause of death. Upon slitting the windpipe the cause became manifest — LUNG-STRONGLE — John McKillop had not previously discovered that the Lung-strongle worm had appeared in the flock, and he seems to have made no efforts whatever to separate sick sheep from healthy sheep, and has no hospital yard set aside this year at all.

Another sheep, 712, turned out to be missing, and where she is we do not know. John McKillop took over three hours to get his sheep together for examination, and even then failed to bring in quite a number. I had to remain several hours on the mountain while he searched for the balance. In explaining the cause of this delay John McKillop said that the moment he let the sheep out of the pasture they rushed off down the mountain on the south side, and it took him no end of trouble to 15 2 collect them again. He found they had gone for water; thus showing to me that he has confined them in a pasture without water, and has not hauled water for their use. This alone would account for the poor condition of the flock.

The water supply of the house has been failing. When I went up the mountain yesterday there was a mere trickel of water in the wooden throughs leading to the reservoir, and the reservoir was almost empty. When I returned I was glad to observe a copious stream of water flowing into the reservoir, showing that some repairs had been executed somewhere on the line of pipe. The water coming in was quite ample for the supply of the house, and should, if it continues in the same quantity, fill up the reservoir and remove all cause for anxiety.

Why not suggest to Miss McCurdy to start some of the young ladies of the Young Ladies Club manufacturing and selling distilled water. We could offer to present her with a still to start someone experimenting. These stills, if I remember rightly, cost about $10, so that sixty cents worth of water a year would pay a good interest on the investment.

These stills practically cost nothing for fuel, for they need only be placed on the ordinary kitchen stove to be operated, and any one who pays more than sixty cents a year for the hauling of water would probably find it cheaper to purchase a water still, or buy distilled water from some amature manufacturer.

16

3 MAKING KITES FLY OFF THE WIND.

Inclined to think that very long cellular kites would be advantageous for this purpose; three celled, four celled, o? even more celled — for the longer they are the more certainly will they tend to place themselves parallel to the wind, like the vane of a weather-cock.

Consider the kite as a long pipe open at both ends. Now, fasten the string at one end of course it would fly with the wind. Now, fasten the string in the middle of the pipe and it would tend to put itself at right angles to the wind, and the pull would be tremendous. The wind would tend to turn each end of, the pipe in opposite directions, so that, either the pipe would break in the middle or be balanced — in an unstable way — by the pressure of the air on each end. As it would be practically impossible to attach the string precisely in the mathematical centre of the kite, the pressure on one end or the other will be greater, the pipe then, will tend to turn — the end experiencing the greatest pressure moving from the wind, the other moving towards the wind — The kite would then present a sloping surface to the wind, and there would be a horizontal component of pressure tending to force the kite to one side, so that the pull of the string would no longer be in the direction of the wind, but to one side.

There would be a continuous tendency on the part of the kite tube — by a weather vane action — to set itself parallel 17 4 to the wind, but this could only be accomplished by a bodily movement of the kite to one side, so that the pull of the kite should make a greater and greater angle with the wind, and in the supposed case of attachment at the centre of the tube, the position of equilibrium would be:—The tube parallel to the wind and the string at right angles to the wind. But this would not be a supporting position and the kite would come down.

RESUME.

With the string attached at one end of the tube-kite the kite would fly with the wind: Attached in the middle, the kite would tend to fly with the string at right angles to the wind (but without lift). ERGO: — If the string is applied at an intermediate point the kite should fly off the wind at an intermediate angle and there should be a residual lift — greater as the angle with the wind is less, and less as the angle made by the pull of the string with the direction of the wind becomes greater — zero lift when this angle becomes 90°. A.G.B.

18

1901, July 25 Thursday At Beinn Bhreagh

Yesterday Bert and Ed Grosvenor went off in Hannam's boat for a camping-out expedition. They took a tent and provisions with them. Had a wet night to begin with, but fine and bright today.

Examined some of the weather maps for July 1894. The temperatures over the country during the first few days of July seem to have been higher than those recorded during the recent hot spell but the maps do not record deaths or prostrations from heat, or speak of a specially hot wave. During the first week in July the barometer seems to have been high over the continent generally, and low on the two oceans. The reverse was the case during the recent hot spell.

Proof of the Existence of an Antarctic Continent.

Completed reading Foster's “Century of Diplomacy in the United States”, an able book, interesting and valuable. Also looked over Dr. Fricker's history of Antarctic Explorations. Valuable but not interesting. I never understood before the nature of the ancient dogma relating to the existence — supposed existence — of a southern continent — To persons who considered the world flat it of course seemed self evident that the oceans must be surrounded by a rim of land, otherwise the water would run off, like water out of a teacup with a broken rim. Hence, the Indian Ocean, was regarded as a closed sea, like the Mediterranean, and although no one had visited any southern continent, it was obvious that such a continent must necessarily exist. The eastern coast of 19 2 Africa was only known a little way down, and the general trend of the coast line was to the eastward of south. On the other hand there was a manifest projection of land in the Malay Peninsula, which extended downward with a tendency toward the west of south. The conclusion was jumped at, therefore, that land extended all the way from Africa to the Malay Peninsula, forming the southern land rim of the Indian Ocean, and all to the south of that was a vast unknown southern continent. It took many centuries to dispell this notion, and it was not until people had repeatedly sailed over great portions of the supposed southern continent without finding bottom that it was given up — if it has been given up.

The belief in the southern continent still exists; but it has shrunken in area, and now is supposed to cover the central part of the Antarctic regions.

Fricker's book is illustrated by a very fine map of the Antarctic regions, and the depth of the ocean is indicated by the shading of blue on the map. There seems to be evidence of a gradual lessening of the depth of the ocean as the Antarctic pole is approached, which certainly affords some ground for the belief that a large land mass exists there. But, on the other hand, the enormous icebergs met with seem inconsistent with a shallow sea. An iceberg 100 feet high involving seven times that depth immersed

Such icebergs could not however, be produced on an open sea. They are undoubtedly the product of land — not only of land but of an enormous area of land, upon which snow and ice have been piled up for hundreds of feet, and upon which huge glaciers exist. It is safe to say that an iceberg 100 feet out of water and seven hundred feet under water could not have been produced upon the open 20 3 sea, or upon a small island. It is a fragment of a glacier that has been projected from land into the ocean until the pressure of the water buoying up the protruded tongue of ice has broken off the fragment, which has then floated off as an iceberg. It might have broken off from a crag and fallen into the sea, but this is less likely in an enormous berg of this character.

In any event a mass of ice like this (800 feet thick)could only have come from a glacier. The glacier could only exist upon land, and the land must have been of very great extent to allow of the formation of a glacier 800 feet deep. The water, too, surrounding the land must have been of great depth to buoy up and support an iceberg of this size.

If there is anything that is characteristic of the Antarctic regions it is — the enormous icebergs that are met with everywhere on penetrating the Antarctic.

To my mind, therefore, the evidence is conclusive that an Antarctic continent does exist, and that its edges are characterized by steep cliffs and a bold sea, deep close up to the land, the outer edge everywhere being fringed with archipelagoes having deep water between the islands, probably now filled with ice. A.G.B. How thick a layer of ice can form on the surface of the sea.

P. S. Why should it be impossible for ice to pile up to any extent on the open sea? Yes, impossible unless the sea be very shallow, because the colder water would sink to the bottom and be constantly replaced by warmer water at the top, so that the temperature of the surface water could not be lowered down to the freexing point until the whole ocean had assumed the temperature of water of 21 4 maximum density.

Speaking theoretically, no more lowering of temperature could freeze the ocean until the whole ocean had assumed the temperature of about 4° C., or whatever the temperature of sea water of maximum density may be. How then can ice form at all on the ocean? Only, it seems to me through a surface layer of fresh water, which might float upon the surface of the salt water long enough to freeze. This could be produced by condensation from fog, by rain falling into the ocean, or by snow.

If from any cause a layer of fresh water, or partially fresh water, is floating on the surface of the salt water, it might freeze and continue to float, and thus form a basis on which snow could pile. How high could this piling process go. In a deep ocean the temperature of the salt water would be higher than the freezing point where the water is in contact with the frozen mass, so that I should anticipate that the frozen film would melt below and grow above by the continual deposition of snow or frozen rain. Could it attain a considerable thickness? I doubt it, unless the ocean in some part should be so shallow as to allow the ice film to touch the bottom. Then we might have an enormous mass of ice anchored to the bottom by its own weight, and why should not this ice mass increase indefinitely in thickness. I see no reason why it should not be thousands of feet thick, and indeed, ultimately become a continent of ice from which at the edges everywhere where deep water existed, hugh icebergs might break off. A.G.B.

22

1901, July 29 Monday At Beinn Bhreagh

Left Beinn Bhreagh Thursday, July 25, 1901 in the late afternoon for Port Bevis, in the gipsey wagon with Marian and Robbie — and Archie to look after the horses. We camped out on the Great Bras D'Or Thursday might just a little beyond Port Bevis. Archie took the horses up to a farm house where he stayed. I occupied the gipsey wagon, and Marian and Robbie camped out on the damp grass — wonder they did't catch their deaths of cold.

I made a fire place of big stones on the shore, and Marian and Robbie — scorning the use of an oil stove which we had taken with us — collected wood and made a camp fire. Before Archie left he brought us a dipper of water, and after the fire was started Marian and Robbie attempted to make a cup of coffee. They boiled the water in a kettle over their camp fire, and then couldn't find any coffee to put into it. However this didn't matter because the water looked like coffee. They had put it into a dirty kettle which hadn't been cleaned for two or three years, with the result that it was undrinkable. However a can of Mulligatawny soup suppled the deficiency.

Friday, July 26, 1901: — We drove in the gipsey wagon from Port Bevis to Englishtown on St. Ann's Bay, and camped outside of the bay on the beach.

Saturday, July 27, 1901: — Drove home to Beinn Bhreagh reaching here Saturday evening not long after the arrival of Bert and Ed Groavenor from their sailing expedition, in which they had circumnavigated Boulardrie Island.

23

Sunday, July 28, 1901: — Mabel and I examined the water supply of this house; it is getting low. Walked along by the water trough which was empty half way down. Found that the ditch leading from the spring to the water trough was entirely closed by dirt and by growths of rushes, and that the water which should have come down the trough was running down the gulley towards the barn where the horses are.

Mabel and I dug out a passage for the water with our hands, and when we came home last night water was running into the reservoir, but in small quantity on account of the leaks in the water troughs. The water in the reservoir is so low that it becomes necessary to economize on water as much as possible — And yet there is quite enough water in the spring to supply the house if it is brought here. Have set a man to work clearing out the ditch as the first step. I propose to widen this ditch so that it cannot possibly fill up again — make it four fee wide and four feet deep, and it will not only catch all the water that there

is in the gulley, but will serve as another reservoir. The ditch must be at least 100 feet long, and if it is four feet wide and four feet deep it would, when full, hold 1600 cubic feet of water.

Was up all night reading Dr. Fricker's book on the Antarctic regions. An extremely valuable book but awfully dry reading. It is a work of reference rather than a book you can read right through. Am now at p. 186. A.G.B.

24

Went to see Mrs. Kennan this afternoon. Mrs. Kennan told me that on Thursday the 25th, in the morning she had been writing a long letter to Mr. Kennan, and also to Mr. McCurdy and Mr. Stanley Brown, and that her mind was filled with Mr. Kennan. She says that she has been in a very nervous condition for sometime and has been anxious about Mr. Kennan, although she knew nothing had happened to him, but she was on a nervous strain to know what he was doing and how he was getting along.

She sat down to luncheon, and suddenly as she sat there she had a strange feeling as if Mr. Kennan was trying to communicate with her. She simply had a very strong feeling indeed that he was trying to communicate with her. She does not know whether anything has happened or not, but I want s to write this down in case anything has happened at that time. She says she noted it down at the time herself (Thursday the 25th). Mabel G. Bell.

N. B. Do not think Mrs. Kennan told anyone about this sensation until after she had received a telegram from Miss Farbell informing her that the New York papers had announced Mr. Kennan's expulsion from Russia. The announcement appeared in the Boston Transcript last Friday evening the 26 th inst.— Copy has been received here this evening — Monday July 29 1901. AGB.

I object to the first part of this statement as was being entirely fair. All Mr. Bell or I know is that Mrs. Kennan did was tell Daisy or we until Monday. She may have spoken of it to lots of people on the other side of the bay MGGB

24½

EXPERIMENT I.

Type-written from stenographic notes taken at the time.

Three-celled Kite

Was flown by the bow. In going up struck a tree smashing one of the long sticks and one of the triangular frames. In spite of this the kite rose well, flying directly with the wind. Mr. Ferguson is now repairing damages. Will fly the kite again by the bow but have another string attached to the front part of the second cell at a point 90 cm. behind the bow string.

Object: — To see whether by gradually tightening the second string the kite will fly off the wind.

Result: — Flown by the bow-string alone the kite flies strictly with the wind. Upon gradually tightening the mid-ship string the kite rises almost to the vertical and then goes off to one side, in this case to the right hand. The kite tends to set itself with long axis parallel to the wind. When she flies by the mid-ship string alone she goes off to one side and begins to dive. By releasing the string so as to leave her flying by the bow alone she recovers. THERE IS NO DOUBT THAT THE PRINCIPLE IS CORRECT THAT THE KITE TENDS TO FLY WITH ITS LONG AXIS PARALLEL TO THE WIND. AGB

25

EXPERIMENT II.

This is a triangular three celled kite with two aeroplanes of red cloth. Double keel. Length, 175 cm.; triangular cell, 100 cm.; width of cotton, 25 cm.; space between cells, 50 cm.;

String No. 1 attached to bow; string No. 2 in front of second cell; space between two strings 75 cm. Side braces.

Result : — Fastened by front string pole she flies with the wind. Now, the effect of tightening the second string tends put her parallel and to depress the stern. She tends to fly with the axis vertical instead of horizontal. She did get off the wind at first, but could not be sure of the tendency. When she is flown by the amidship string alone there is a tremendous pull, the kite goes down very much lower, and seems to be trying to set herself at right angles to the wind instead of parallel.

No certainty in these results. Must stop now. This is a beautiful kite, flies steadily and well.

AGB

26

1901, July 30 Tuesday At Beinn Bhreagh

Mrs. Kennan is here, and we can obtain from her own lips an account of her psychic experience the other day.

Mrs. K. It was about one o'clock on Thursday, the 25th, I was reading in the dining room, and suddenly felt a spiritual influence as if Mr. Kennan was personally near me, and as if very anxious to communicate with me in some way. Of course it was over in an instant, but the sensation was strong enough to have left me feeling rather shaken up. That is all there was.

CROSS EXAMINATION BY A.G.B.

A.G.B. Did you make a note of this at the time?

Mrs. K. No, but I spoke of it in a letter to Mr. McCurdy, on Friday, the 26th, and then I went and marked the calendar.

X. INT.

A.G.B. When did you first communicate the fact to another person or make record of it?

Ans. I don't know, but I spoke of it to Daisy on Monday the 29th, and then we began to have a great deal of fun about it.

X. INT.

A.G.B. Then I understand that the first communication or record was made in your letter to Mr. McCurdy, which you think was written on Friday, July 26. Is that so?

Ans. I should have to look in my letter book to answer that.

X. INT.

A.G.B. Can you remember whether it was before or after the receipt of a telegram from Miss Tarbell that you wrote to Mr. McCurdy?

Ans. Afterward, because Miss Tarbell's telegram came about half past eight in the morning. (I wrote to Mr. McCurdy on Thursday and Mr. Stanley Brown, and it was on that day that I felt that psychical influence, but I cannot remember whether I wrote Mr. McCurdy on Friday or Sunday without reference to my letter book).

27

X. INT.

A.G.B. Do I understand however correctly that you are sure you wrote this letter to Mr. McCurdy after receiving Miss Tarbell's telegram and not before?

Ans. Can't remember.

X. INT.

A.G.B. Did you make any note of the peculiar sensation in your letters to Mr. McCurdy and Mr. Stanley Brown written on Thursday the day the sensation was experienced?

Ans. No, because if I remember rightly it was after I had written the letters I felt so. I was writing all day until about three o'clock on Thursday, and I don't remember the order that the letters were written in, and I don't think that I spoke of the psychic sensation to anybody in the letters that day. My talk with Mrs. Bell was on Monday afternoon, and I spoke of writing Mr. McCurdy the day before on Sunday, when I am sure I did speak of having this feeling, and feeling a curiosity of knowing whether anything had occurred.

X. INT.

A.G.B. Now, what I want to get at is what was the date of that communication to Mr. McCurdy? You seem to think now it was Sunday.

Ans. I cannot answer that question without looking at the letter book.

X. INT.

A.G.B. Are you certain however that it was after Miss Tarbell's telegram?

Ans. I am not certain about anything.

X. INT.

A.G.B. When did you receive Miss Tarbell's telegram?

Ans. Saturday morning about half past eight (July 28)

X. INT.

A.G.B. What did Miss Tarbell say?

Ans. I cannot be accurate because I had the telegraph by telephone, and they have not sent me a copy although requested to. “Yesterday's papers state Mr. Kennan expelled from Russia.” That is all.

X. INT.

A.G.B. Now let us see whether we can fix with definiteness for Mr. Kennan's information the exact time that the sensation was experienced. I understand you to say that this happened on Thursday the 25th of July. Now what proof have you that it happened on that day?

Ans. All the circumstances of the morning impressed it upon my mind. I had letters in the morning mail from Mr. Stanley Brown, Mr. McCurdy and Mr. Kennan, and began to answer them as soon as I was up; writing a long business letter to Mr. Stanley Brown the first thing, then to Mr. Kennan and Mr. McCurdy, and it was just before, just after lunch, that I had this psychic impression.

X. INT.

A.G.B. Do you remember any item in the newspapers you were reading that day?

Ans. No, but Miss Caroline McCurdy had a tea party that afternoon, and I remember feeling that I wouldn't go over excepting that I would meet Mrs. Bell there, and the idea floated through my mind that I would speak to her of this sensation. But when I got over to the tea I found Mrs. Bell just going home, and in a hurry, so I said nothing to her Afterwards I went home with Mrs. Carruth and had dinner and when I got back home and

went to bed I had a great feeling of depression and anxiety about Mr. Kennan and did not sleep well, being awake many times with this feeling of anxiety.

A.G.B. N.B. Miss Lina McCurdy's sea was certainly on Thursday July 25. If Mrs. Kennan has preserved the envelopes in which the letters came from Mr. McCurdy, Mr. Stanley Brown and Mr. Kennan, it might be a good plan to look at the date of the postmark on the envelopes and put them down here for Mr. Kennan.

Mrs. Kennan's lunch was between half past twelve and one by Halifax time; that would be half past eleven or twelve by eastern standard time.

29

X. INT.

A.G.B. When Mr. Kennan returns we will try to find out from him whether anything special happened on Thursday, July 25 &c., &c., In the meantime for purposes of comparison it would be well for Mrs. Kennan to put down all she can think about relating to that sensation.

30

1901, July 31 Wednesday At Beinn Bhreagh Lab.

Remarkable properties of bamboo (Shorthand dictation)

If we don't make a dictation every day we will soon get out of the habit of it. The special object of these notes is to get down what I am thinking about. It is now Wednesday afternoon and we have occupied the forenoon with other things.

What have I been thinking about, yesterday, last night and today? Well, there is one thought that has been haunting me in the back corner of my brain, a sort of unconscious cerebration process, and it is expressed in one word

BAMBOO

The properties of bamboo are contradictory and extraordinary. It is very hard and yet soft, you can cut it with a pen knife; very tough and extremely elastic, a kite framework made of bamboo could hardly be broken. I am surprised at the ease with which the wood can be worked, had the idea that it would require special tools. Amused myself yesterday afternoon in whittling with my pen knife, found no difficulty whatever in cutting it and shaping it.

The hard part seems to be confined to an outside skin of very slight thickness; the inner part is almost as easily cut as a piece of pine. When we make kite-frames of pine or spruce, we are quite accustomed to sticks here and there giving way. If the kite comes down with a bump, something has broken, a wind squall too, will smash a cell. If the kite 31 framework could be made of bamboo none of the ordinary accidents to which we are accustomed would break it.

Another contradiction: — Bamboo is very heavy, and yet light — specifically heavy and yet it can be used in such thin pieces as to constitute a very light framework.

Yesterday I cut away the soft backing from the hard shell, and then found that though the hard shell resisted cutting transversely it could be split up with a pen knife into quite fine hairs.

Altogether I consider that bamboo has very remarkable properties, and is admirably adapted to make a light, tough, strong, elastic framework for a kite. I do not know anything better, but we require to learn how to work it. It lacks, however, rigidity. If we use a piece sufficiently thick to be rigid it is very heavy in comparison with other woods.

The first experiment, made with a three celled triangular kite 60 cm. diameter and 218 cm. long, seemed to indicate that a kite of great length if flown by the bow, flies with the wind

and flies off the wind to a greater and greater extent as the string is attached to a point nearer and nearer to the middle of the kite.

The triangular form, however, is not well adapted for control in flying off the wind, because when flown at an angle to the wind it leans over on one side and no longer flies on an even keel. The Hargrave form, I think, would be better; 32 the wind would not only make the kite fly with its long axis parallel to the wind, but would also tend to keep the aeroplane surfaces horizontal, so that if the kite should be flown by means of a string attached to the left side the kite should fly off to the right, and if attached to the right side, to the left.

Mr. Ferguson is now making a kite of the same general dimensions as the triangular kite used in Experiment I, the other day, (see p. 24), but of the Hargrave form. Each cell will be 50 cm. by 25 cm., and the cloth 25 cm. wide. The whole kite to be 200 cm. long, four times the length of the cell.

These long kites are not strong and would be very easily broken, they should, therefore, be braced in very numerous places, and I would adopt the principle that a multitude of very thin sticks would afford a stronger framework than a few sticks of greater diameter, and be lighter.

Suppose you have two sticks of the same length and square in cross section, one,half the diameter of the other. The thinner weighs one-fourth of the thicker one, so that four of the thin sticks would be equivalent in weight to one of the thick ones, and I think that four such sticks placed at short intervals apart would give greater strength than thick sticks placed at great intervals apart without weighing more. A.G.B.

33

1901, August 1 Thursday At Beinn Bhreagh.

THOUGHTS.

Establish on Beinn Bhreagh a place where the men employed can obtain board at reasonable rate. The absence of such a place has forced Mr. McInnis to turn his own house practically into a boarding house, and Mrs. McInnis has to provide the board.

Build a restaurant for the men on the side of the road next to Mr. McInnis's office, with kitchen department behind, a dining room in front with a veranda, &c., and employ some competent person to run it and provide board, or partial board for such men as desire it, on reasonable terms. Send down there the newspapers and magazines we don't want here where the men can read them.

We have tried this before, but it didn't work very well. The newspapers and magazines were sent to Mr. McInnis's office, and the idea was to establish cordial relations between the men and Mr. McInnis by making his office headquarters and reading room. This didn't amount to very much. Why I don't know, but I am inclined to think that meeting with the men on an equality was practically impossible with one placed over them in authority. The young men might not feel perfectly free and easy in Mr. McInnis's office and under his eye. Of course I may be all wrong. All I know is that the books and magazines piled up there practically unread, and I don't think that the men met there excepting when I was there personally myself — I mean as a rule.

34

The meeting room at the warehouse, too, is practically a failure so far as the men are concerned. It is only used occasionally for entertainments.

Now, if we had a building having as its central source of attraction — BREAD AND BUTTER — that will bring men together and of course where meals are concerned there is always a certain amount of lost time when people must loaf about. Well, give them a loafing place, a room provided with newspapers and periodicals, a veranda on which they can smoke their pipes and chat. In connection with the dining room it might also be

advisable to provide a place where they can wash up and be clean with soap and towels and basins, &c.

I think that a nice respectable private restaurant, where the men could obtain board, would remove discomfort from Mr. McInnis's house, and promote the comfort of every one on the place. By having it on the road it will be constantly under inspection, and will be in conformity with our policy of making the warehouse wharf the center of activity on the place, and allowing a little settlement to grow around it. Good water can easily be supplied in quantity to all the places at that level — indeed pressure sufficient can be obtained to enable us to use fire hose. Perhaps, too, it might be advisable to have a boarding house connected with the restaurant. It is our duty to see that the permanent hands who live upon the place are properly accommodated.

Such a boarding house or restaurant should not be high 35 up on the hill; not even as high as Mr. Ellis's cottage, but should be placed where it is passed every day by us, so that it will be constantly under our own eyes, and we can see that it is properly carried on.

Then, I think, that Mr. McInnis and his family should have another and a better house, and should not KEEP BOARDERS. The position of our Manager should be a desirable position, so that he and his family should stand upon the same level with the best people in Baddeck. They cannot avoid boarding the men so long as we do not provide a boarding place for them, but when relieved of this drudgery, I think it would be well that they should have a nice house and garden in an accessible place — not perched away up on the mountain side where nobody can get at it. I have for a long time thought that if I were Manager I should like to have my house in the open space next to Mr. Ellis's house, but lower down and nearer the road.

Well, we are wandering, and taking up too many points at a time. The chief point and the one requiring immediate solution to my mind is — a restaurant for the men. While we are forming plans for the building it could be started at once in the upper part of the

warehouse, if we could find a suitable person to run it. That is central for the whole place. I would not have two or three separate boarding houses, it would be better to centralize. The men at the Point can ride down to dinner if it takes too much time to have them walk. A wagon can go up for them and take them down to the warehouse 36 and take them back. That would be better I think than boarding some at the gardner's cottage, and others at Mr. McInnis's and the warehouse. I would provide one place where board can be obtained. And then have everyone go there excepting the persons employed in this house itself.

THOUGHT.

Would it do to include them too, and let them, or some of them go down to the restaurant? It is perfectly conceivable that Charles — or at least the men about the place — would like the change of going down to the settlement for their dinner and meeting the other men employed on the place. This would relieve the kitchen, leaving meals to be provided only for the girls. A.G.B.

First thing to be done to see who could run the thing — make inquiries for a suitable caterer

37

1901, August 2 Friday At Beinn Bhreagh

Had a talk with Mr. McInnis yesterday. Best immediate solution of our problem is to have Mr. McInnis and his family occupy the Ellis house and employ someone to run Mr. McInnis's house as a boarding house. Mr. McInnis is now looking round for someone who can do this.

The great heat wave of 1901

The weather map for July 29 shows the beginning of the end of the great hot wave of 1901. It says “After an unprecedented duration of forty days, the great drought and hot wave in the corn belt has been broken by thunder showers which were quite general, and in many places heavy.” &c

The July weather maps that I have examined for this year have been characterized by low pressure over the interior of the continent, and high on the two oceans. The July weather maps for the early part of July, 1894, showed just opposite conditions of pressure, high over the central part of the continent, low on the two oceans. It is therefore interesting to observe that the breaking up of the hot wave this year is accompanied by an advance of high pressure from the northwest almost into the middle of the continent, and an advance of high pressure from the southeast almost meeting the other. A trough of low pressure, with condensation of moisture exists between them, finding an exit to the sea over Massachusetts and New York.

38

The weather map for July 30 shows that the high areas from the northeast and the southeast have united, so that a ridge of high pressure extends right across the continent from the northwest to the southeast with its greatest height in the Montanas.

Why is there more Ice in the Antarctic than in the Arctic Regions.

Have nearly finished Dr. Fricker's book on the Antarctic Regions.

Why should there be such a preponderance of ice in the Antarctic, as compared with the Arctic regions. Is it not because the southern hemisphere consists largely of water, and the northern hemisphere of land. There is more water to be evaporated in the southern hemisphere than in the northern, more vapor therefore to be condensed, and why should there not be — as a consequence — a larger collection of ice and snow.

Then, the world is nearer the sun during the southern summer, than it is during the northern summer, so that the intensity of the sun's heat would be greater and the evaporation of the water, therefore, more rapid.

Mr. Ferguson will probably have the new Hargrave kite completed this afternoon, although there seems to be no wind to try it.

39

This is a four celled kite 200 cm. long, each cell 50 by 25 cm. covered with cloth 25 cm. wide.

There are four places (a), (b), (c), (d), for the attachment of strings, and at these points the kite is strengthened by cross-bracing. The kite will be flown;

1. By two strings attached to points (a) and (b). When both strings are equally tight I expect the kite to fly with the wind. By loosening string (b) so as to leave the kite flying by (a) alone I anticipate that the kite should go off to the right, and when the kite is flown by string (b) alone, it should go off to the left.

2. The strings will then be shifted to (c) and (d). In this case similar results should happen, but we may anticipate that the kite would fly further to the right and further to the left than before, and that the pull should be greater.

Should we find that the kite answers expectations I shall make the experiment of attempting to sail a boat against the wind by means of this kite. As I do not think I have anywhere clearly described the reasons that lead me to believe that we can tack against the wind with a kite, it might be well to elaborate them here before the experiment is made.

40

HOW TO SAIL AGAINST THE WIND WITH A KITE

When a boat is dragged by a kite we find that we can steer the boat at a considerable angle to the pull of the string, the limit being 90° on either side of the pull of the string. If then, the kite flies with the wind we are limited to a steering angle of 90° from the wind.

If, however, the kite can be made to fly off the wind,— say 10° — then the string pulls 10° to one side of the wind and we can steer the boat up to the limit of 90° from the pull of the string, i.e. 10° UP IN THE WIND.

In the following diagram the direction of the wind is shown by the dotted arrow (Ba) and a direction at right angles to the wind by the dotted line (Bb), when, therefore, the kite flies with the wind we can only steer to one side of the wind up to the limit of angle (aBb). (K) represents the kite flying off the wind, and the arrow head (BK) shows the direction of the pull of the string. This makes an angle (KBa) with the wind. The line (BX) shows the extreme limit of the direction in which we can steer to one side of the pull of the string, making a right angle (XBK).

The angle (XBb) equals the angle (KBa) that is the boat can sail up into the wind to the same extent that the kite can be made to fly off the wind. The line (Bb) is at right angles to the wind, and the (BX) is the direction — or rather the limit of the direction in which the boat can sail up into the wind. The angle (XBb) representing the angle.

When a tack is made the kite (K) being flown by the other string should fly off the wind to the other side, see diagram below, and (BY) represents the new direction in which the boat can sail.

The boat can sail up into the wind to the extent of the angle (YBc), which is the same as the angle (KBa) — the extent to which the kite flies off the wind.

Thus it should be possible to tack up against the wind by making the kite alternately fly off to one side or the other of the wind in accordance with the tack made. A.G.B.

42

1901, August 3 Saturday At Beinn Bhreagh

The new kite shown on p. 39 was tried yesterday afternoon although there seemed to be hardly any wind. It impressed one as an exceedingly light kite and yet strong, although there was no cross-bracing excepting at the rear of the first cell (ab) and the front of the second cell (cd).

We tried first flying the kite by two strings attached to the points (ab), but the wind did not prove to be strong enough to support the kite. We then attached two lines to the points (c) and (d), (p. 39), and then found that the kite would support itself although there was hardly any wind.

The kite acted exactly as anticipated. When flown by point (c), it flew off to the right. When flown by point (c) it flew off to the left. Will make more extended notes of its action when we have a better breeze to work with.

When the kite flew off the wind I observed a tendency in the kite to lie with the aeroplane surfaces inclined: One of the bottom angles being lower than the other, perhaps the kite was not wide enough to make it keep an even deck. The tendency to fly with the long axis parallel to the wind was most marked, indeed there can be no doubt that this feature of the kite is O.K.

Believing that this kite will be a success in a good breeze, but is rather light to tow the Jallan Jay Booy, I have ordered another kite made of similar construction, but double the dimensions every way.

43

HOW TO SAIL AGAINST THE WIND WITH A KITE.

Find it difficult to express in a sentence the principle of sailing a boat against the wind with a kite, although it is clear in my own mind.

You can steer a boat at any small angle with the pull of the string, your limit being 90° on either side. The difficulty most people have in understanding this statement is that they place the limit at 90° to the direction in which the wind is blowing. The limit is 90° from the direction in which THE STRING IS PULLING. If the string pulls in the direction of the wind, then the limit is 90° on either side of the wind, and we can make no advance against the wind. But, if the kite flies off the wind, so that the string pulls to one side of the wind, then we can steer up to a limit of 90° from the direction in which the string pulls, which will be so many degrees against the wind. If we can make the kite fly 10° off the wind, then we can steer 10° up into the wind. The extent to which we can sail against the wind depends upon the extent to which we can make the kite fly off the wind.

I have a little matter here expressed in many words — not satisfactory. Now let Miss Safford try her hand: —

44

MISS SAFFORD'S EXPLANATION.

When the kite is flying with the wind the boat can be steered at any angle up to 90° on either side of the wind. If however, the kite can be made to fly off the wind, the boat can be steered at just that angle more than 90° to the wind. In other words, the boat does not go necessarily with an angle to the wind, but with an angle to the pull of the string of the kite. What Mr. Bell is trying to do is to get the kite to fly at an angle to the wind, and in that way the boat is made to go up into the wind at exactly that angle.

PRINCIPLE INVOLVED. (A.G.B.)

Steering depends upon the direction in which the string pulls , not upon the wind. We can steer up to a limit of 90° from the direction in which THE STRING IS PULLING in whatever direction the wind blows. For example, if by any means we pull a boat by a string at right angles to the wind — omit all consideration of the kite, that has nothing to do with it — fix your attention on the string. You can put the string in another boat if you like, rowed by a man, so that it becomes a tow line — that is it — A TOW-LINE. — You are not obliged to follow ing directly in the tow of the other boat, but can steer to one side of the pull of the tow line, and the limit to which you can steer is 90° on either side of the two-line. If you steer at 90° then you make no headway, but are a simply a drag on the other boat. But at 45 every less angle to 90° you make headway in the direction of steering.

Now imagine our boat to be towed by a tug-boat, in the open sea. If the tug boat goes in the direction in which the wind is blowing you can steer on either side of its course up to a limit of 90° to the tow line, and at your extreme limit you are going at 90° to the wind, so that you make no headway up into the wind.

Now change the course of your tug boat and let the tug-boat try to tug you at right angles to the wind, than again you can steer on either side of the tow-line up to a limit of 90°, so that on one-side you could steer your boat right up into the wind's eye and on the other side you could steer it so as to go with the wind. In considering the direction in which you could steer your boat, the direction in which the tow line pulls is everything.

It matters not whether the tow-line is pulled by a tug-boat or a row-boat or a mule upon the banks of a canal or a kite in the air. You can steer up to a limit of 90° FROM THE DIRECTION IN WHICH THE TOW-LINE PULLS, and if you can so arrange matters that the tow-line does NOT pull in the direction of the wind, but to one side of it, then 90° from the pull of the string may mean the ability to steer against the wind.

Is this clearer? Or have I multiplied matters with words. What does Miss Safford say?

Miss Safford.

“I think the illustration of the tug-boat makes the matter a little more clear”.

A.G.B.

I think it does too. What we want to do in explaining the idea is to get rid of the wind and get rid of the kite and fix attention only ON THE TOW-LINE AND THE DIRECTION IN WHICH IT PULLS — AND THE ABILITY TO STEER UP TO A LIMIT OF 90° FROM THAT DIRECTION. A.G.B.

Oh, My! I think any one who doesn't get that idea is a pretty big grump!!! Marian H. Graham Bell.

47

EXPERIMENT I.

Kite suspended by two strings attached to points (a) and (b). Hardly any pull but moves from side to side in a most extraordinary manner, hardly steady at all, but flies substantially with the wind.

EXPERIMENT II.

Strings attached to points (c) and (d), in front of the second cell. Very little wind, but the kite is perfectly steady in the air.

Flown by point (c) alone the kite flies off to the right about 30°.

Flown by point (d) alone the kite flies off to the left about 30°.

48

1901, August 5 Monday At B. B.

1901 Aug. 4 Sunday at BB Hall Sailing against the wind with a Kite

49

Making a tack AGAINST THE WIND with a Kite.

(This requires skill to get into position 3 before the left hand string tightens up.)

50

Making a tack WITH THE WIND with a Kite.

51

1901, August 7 Wednesday At Beinn Bhreagh

Still waiting for wind, cannot make any advance in kite experiments without (1) either either (1) more wind, or (2) lighter kites.

We cannot control the former condition, but we can the latter. The kites we have hitherto made have been intended for actual use in a boat, so have been made strong. I do not care to make any changes on these practical-sized kites until those kites we have have been well tested.

OBJECT : — Our first object — to learn how to make a kite fly off the wind — has not yet been satisfactorily explored, and we cannot even test the kites we have without more wind. This point, however, — the flying off from the wind — may perhaps be as satisfactorily tested with toy kites as with large ones, and I have asked Mr. Ferguson to make kites like those we already have on a diminutive scale with frame-work made of sticks as thin as matches, and covered with light paper so that we may have kites that will fly with a mere breath of air. We can then attach these kites to a short line fastened to the end of a bamboo pole, so that the kite will take the place of a fish at the end of a fishing rod and line. Then, even if there is no wind, we can make the wind by walking along with the fishing rod, and in this way test that construction which will enable a kite to fly off the wind. It is aggravating to be unable to test the apparatus we have — and still more aggravating

to see vessels sailing about in the bay under the influence of the wind that will not support our kites.

We have suffered from the presence of trees. I have noticed that there seems to be a good deal more wind out in the 52 middle of the bay than there is close in shore at the laboratory wharf, or on the hill above the laboratory. The shore in the neighborhood of the laboratory seems to constitute a wind — pocket. With the wind blowing directly from Baddeck towards the Lodge Harbor there is hardly a trace of wind on the shore.

However, for our purposes we can control all the conditions: —

MAKE TOY KITES — AND MAKE THE WIND BY RUNNING WITH THE FISHING POLE: — All we want is to learn to make a kite fly off the wind and we can do this with a toy in full confidence that the knowledge gained will be applicable to full sized kites.

AGB

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Last Sunday (August 4) I amused myself making some paper feathers with bamboo stems (see Home Notes 1901, Aug. 4, p.77) A thin slip of bamboo — almost a filament — was placed between two thin sheets of paper mucilaged together. The paper was then cut out in the form of a feather, the bamboo filament constituting the mid-rib.

If at any time we wish to copy a bird's wing in a kite or a flying machine, this would seem to be an admirable way of making artificial feathers.

54

AGB

55

EXPERIMENT I.

Four celled Hargrave Kite. Flown by points (a) and (b) Very unsteady, goes from side to side.

EXPERIMENT II.

Same kite flown by points (c) and (d), midway between the first and second cells. A little steadier but still wabbles from side to side

EXPERIMENT III.

Same Kite. Two strings attached to the front edge of the second cell. Much steadier than before, but still goes from side to side and jerks in an extraordinary way.

When flown by the left hand string the kite goes to the right. When flown by the right hand string the kite goes to the left.

The cross-braces in cells 1 and 2 make that end of the kite heavier than the other. This may possibly have something to do with the unsteadiness. To test this point we will turn the kite right around and repeat the experiments with the cells at the other end.

EXPERIMENT IV.

String attached to the back of the first cell (formerly front of the 4th cell). Very unsteady.

EXPERIMENT V.

Strings attached half way between the first and second cells (formerly 4th and 3rd cells). Steadier but still wabbles from side to side. Does not fly off the wind and does not answer its helm well.

EXPERIMENT VI.

Strings attached to the front of the second cell (formerly the back of the 3rd cell). In this position the kite goes to one side and then to the other, and dives so that it does not support itself in the air.

EXPERIMENT VI-½

(Formerly front of 3rd)

Strings attached to the back of the second cell. The kite flies very steadily with the wind. Flown by the left hand string alone she turns on her side to the left. Instead of having her decks level and going to the right, she turns over on her left side and goes to the left and dives.

The kite has dived and come down. It is obvious that this kite requires cross-bracing in order to be sure of our results.

The wind bends the whole kite, George McCurdy reports. Seen from a distance the kite bends into a bow shape, something like this.

To face p. 57

Exp. 7

Exp. 8

Exp. 9

Exp. 10

The pictures are misleading as they suggest that the Kites were flown from the bamboo pole. Mr. Ferguson only appearing in the last picture. In all these cases the Kite string was held in Mr. Ferguson's hand as shown in Exp. 10. AGB

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EXPERIMENT VII.

Two-celled triangular, braced kite with protruding rod one meter in length.

Flown by the bow the kite flies very steadily.

EXPERIMENT VIII.

Flown 25 cm. in front of the bow the kite flies steadily at a slighter angle.

EXPERIMENT IX.

Flown 50 cm. in front of bow the kite flies extremely steadily. Angle growing less.

EXPERIMENT X.

Flown 75 cm. in front of bow. The kite flies perfectly steadily, the angle growing less and getting more and more toward the horizontal.

To face p. 58

Exp. 11

Exp. 12

Exp. 13

58

EXPERIMENT XI.

Flown 100 cm. in front of bow, line almost horizontal, still does raise a little.

We will now fly the kite from bamboo pole to get photograph.

EXPERIMENT XII.

Flown from bow again. Angle is very much greater. Flies well but still a little unsteadily.

EXPERIMENT XIII.

Flown by back of front cell. Hardly flies at all

To face p. 59

Exp. 14

Exp. 15

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EXPERIMENT XIV.

One-celled Hargrave with protruding rod 100 cm.

Flown 100 cm. in front of bow

Result : — Not quite up to the horizontal, but very steadily. Position apparantly indifferent. Sometimes on its side, and sometimes up-side down.

EXPERIMENT XV.

Flown at 50 cm. in front of bow.

Result: — Pretty steady, almost up to the horizontal, but does not fly as well as when the string is attached to the end.

60

EXPERIMENT XVI.

Flown 25 cm. in front of bow.

Result: — Not much different from the last. When wind squalls it flies with string above the horizontal.

EXPERIMENT XVII.

Flown with string in front of cell.

Result: — Not enough wind to test what it will do. Most extraordinary motions though.

To face p. 7 61

Exp. 18

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EXPERIMENT XVIII

One-celled Triangular Kite, with protruding rod 1 meter.

String fastened 1 meter in front of cell.

Result: — Flies very steadily not above the horizontal.

EXPERIMENT XIX.

Flown 50 cm. in front of cell.

Result: — Steady but not up to the horizontal

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EXPERIMENT XX.

Flown 25 cm. in front of cell.

Result: — Flies up-side down. Not enough wind to test what it will do.

EXPERIMENT XXI.

Flown with string fastened close up to the cell.

RESULT: — Not enough wind to show what it will do.

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EXPERIMENT XXII.

Baby Bamboo Hargrave Kite.

Cell 25 × 10 × 10 cm.

Length 35 cm.

Space between cells 15 cm.

String fastened at points in middle of front cell.

Result. Something wrong with it. Whirls round, and round, and round, and round, and dives to the ground.

63½

1901, August 8 Thursday At B.B.

One important point settled by yesterday's experiments is that the person flying the kite cannot properly observe his own experiments. He always looks at the kite in the direction of the string. The observer should be at some distance observing the kite from a different point of view.

George McCurdy reported our four-celled Hargrave kite as bent almost into the form of a bow by the pressure of the wind in one of our experiments, and this deformation revealing structural weakness was quite imperceptible from my point of view. It was an important observation, too, because it revealed the cause of the erratic behavior of the kite.

A series of experiments in which the kite was flown by two strings attached to corresponding points on each side of the kite successively at the points marked (1), (2), (3), and (4). (1), back of first cell; (2), midway between first and second cell; (3), front of second cell; (4) back of second cell. The two strings were held in the hands like the rains of a horse, right hand string in right hand; left hand string 64 in left hand. Both strings at first being equally taut. The object being to ascertain the behavior of the kite in flying off the wind when one or the other string was slackened.

As a general result (with the strings equally tight) the kite flew more steadily as the point of attachment was further back. At point (1) the kite moved from side to side in such an unsteady fashion that the experiment was not made to ascertain how far it would fly off the wind when flown by one string alone. At point (2) there was still considerable swaying motion, so that we did not try flying off the wind in this position. At point (3) there was much greater steadiness, but still very much more motion than in experiments made some days ago.

The kite seemed to fly off the wind to the right or the left as desired, but its behavior was too erratic to allow us to trust it in experiment with a boat.

At point (4) the kite was remarkably steady, but was nearly vertical. A tremendous pull. It was in this position that George McCurdy reported that the kite was bent into a bow shape. There was probably deformation in all the other positions unobserved because of the point of view.

The kite has no cross-bracing excepting at the back of the first cell, and the front of the second cell, and it is obvious that we cannot rely upon our results unless the kite is sufficiently braced all over to retain its shape under the pressure of the wind.

Mr. Ferguson has received instructions to complete the bracing of the kite, not only inside of the cells but on the sides, top and bottom. To came to the conclusion that it was 65 useless to try the large four-celled Hargrave Kite until it had been completely braced.

The experiments with the two-celled braced triangular kite, with protruding rod, yielded, I think, conclusive results

We were unable to make this kite fly with the string attached to the back of the front cell, but it flew well when the string was attached to the bow. The string rising at a considerable angle above to the horizon.

As the string was attached to points further and further in advance of the cell, the kite seemed to fly more steadily, but the the angle of the string above the horizon became less and less, until, with the string attached at a point 100 cm. in front of the bow, the string was almost horizontal.

66

A number of experiments were made yesterday with one-celled kites of the Hargrave and Triangular forms, with protruding sticks. The results were not very satisfactory; still the general result was obvious that these kites flew more and more steadily as the string was attached to points further and further in advance of the cell. In no case, however, did the string seem to rise higher than the horizontal.

With the string attached close to the cell the most extraordinary motions resulted. (I should say that in all these cases of experiments with one celled kites, the kites were attached to the top of a bamboo pole). Mr. Ferguson, who was standing close beside the bamboo pole had to watch the kite closely to avoid being struck by it. It would occasionally dart forward

against the wind, and the protruding stick moved in a most threatening way against Mr. Ferguson, like a fencer trying to run him through with his foil.

As the string was attached to points further and further in front the kite flew more steadily, but in every case the string made an angle BELOW THE HORIZONTAL. The further and further out it was attached the more horizontal became the string. The limit of flight seemed to be the horizontal.

The little Baby Bamboo Hargrave Kite acted in a most extraordinary manner, although I could detect nothing wrong with the form of the kite. It whirled round and round for some time, and then dashed itself down to the ground. It was not broken, however, nor did it seem to be distorted. I noticed that in lulls between the puffs of wind it seemed to fly well, and then commenced its extraordinary girations when the wind 67 increased. From this I judged that the kite was temporarily deformed by the pressure of the wind on account of the elasticity of the bamboo frame-work, and that upon the cessation of the wind the elasticity of the bamboo frame-work restored it to its original shape. This little kite had quite hard usage, being dashed to the ground several times with considerable force. It is therefore somewhat remarkable that it came through all this without injury, especially when we consider that the cells were made of quite thin paper.

One general result of all the experiments is that RIGIDITY is a desirable feature. The only kite that was not erratic in its movements was the two-celled triangular kite which was well braced in every direction.

Another point worthy of notice is that elasticity in the frame-work prevents injury to the kite. The Baby Bamboo Kite stood — without injury — usage that would have smashed all the other kites flying.

AGB

68

1901, August 9 Friday At B. B.

Mr. Ferguson completed another Baby Bamboo Hargrave Kite, but this time with four cells instead of two. As there was good wind yesterday, we tried to fly it from the top of the bamboo pole. It proved to be very unsteady when flown by a bridle from several points, swaying about, whirling round and round and occasionally diving. Thinking that this might be due to distorting of the kite by the pressure of the wind owing to the elasticity of the bamboo frame-work, I examined the kite from several points of view, but could not detect any distortion.

As it swayed backward and forward the kite seemed to be trying to go on edge, but was restrained by the bridle.

Upon attaching the bridle to the narrowest part of the kite instead of the broadest it flew perfectly steadily on edge.

69

This suggested the thought that the extraordinary behavior of the Baby Bamboo two-celled Hargrave Kite might have been due to the way in which it was flown, broadside down instead of edgeways, and not due to distortion of the kite on account of elasticity. So we tried the two-celled kite again yesterday, and found that we could not fly it at all with the broad-side down. It would simply whirl round, and round, and round; whereas with the narrow side down it flew beautifully, and perfectly steadily

70

We tried yesterday the red-clothed, four-celled, Hargrave Kite (see pp 39, 47, 48, 49, 50, &c). (Cells 50 × 25 × 25 Length 200 cm.)

With the broad side down it flew very unsteadily in the gusty wind. With the narrow side down it was perfectly steady, but proved to be unable to support itself in the air. It gradually came down.

We then tried the Standard Hargrave Kite “Weather Bureau Kite”, cells 100 × 50 × 50 cm, I think perhaps 100 × 30 × 30, length about 100 cm. This flew beautifully in the ordinary way of broadside down, but swayed considerably under the gust of wind.

With the narrow side down it proved to be unable to support itself in the air.

Experiments were made both with the Hargrave standard kite, and the four-celled Hargrave. Flying by two strings, to test flying off the wind. In both cases the kites did fly off the wind when flown by one string attached to the side of the kite, but the actions of the kites were too erratic to enable us to get decisive results.

We can certainly get a great deal of valuable information by making toy kites — or rather I should say small models of kites for they are not toys — and flying them from a bamboo pole. The results of experiments with these small kites can certainly be applied to larger ones.

71

Thought: —

Why not attach a RUDDER to a kite and steer it to one side or the other of the wind.

One thing that is conclusively settled by our experiments with large kites is that we can manipulate a kite in the air through the intermediary of strings. We can fly a kite by several strings attached to several parts of the apparatus, and by loosening up one or more of these strings we can leave it flying by the others alone, or any of them.

Now, let us take our best kite, the Standard Hargrave form and fly it by a good stout cord from a single point, the central point of the front cell. Let this bear all the strain of pulling the boat. Then we can manipulate a rudder or appendages of any sort by means of subsidiary strings, which need not be heavy because they are not required to support the strain of pulling the boat.

The Hargrave form lends itself readily to the attachment of a rudder: —

72

By means of SUBSIDIARY STRINGS the effect of an appendage of any sort can be tried upon a kite while flying in the air. Tether the kite by its flying cord, and then work the appendage by means of subsidiary strings, which should all leave the kite at the same point to which the flying line is attached, so that the strain upon the kite produced by pulling on the subsidiary cord should come only upon the place where the flying cord is attached. The direct effect of the strain in such a case could affect the kite in no other way than by pulling on the flying cord. If any difference of effect is noted it will therefore be due to the proper action of the appendage, whatever it may be.

We can test the effect of horizontal and vertical rudders, or fins, keels, or appendages of any sort, placed anywhere — for example in front — like the beak or head of a bird. We could open and close a fan shaped tail.

We might even, perhaps, reef the main sails of our kite and change to a very considerable extent the surface exposed to the wind.

If we had anything like wings attached to the kite, we could open or close them through the subsidiary cords, or hold them in any position, &c., &c., &c.

73

Thought: —

We could easily arrange a manometric flame apparatus to be worked by a telephone. Let Mabel look at the reflection of the flame in the rotating mirrors. Though she might not be able to make out words, she could certainly perceive signals and note a change in the forms of the vibrations

Thought: —

We have no gas here. Perhaps beam of light reflected from a diaphragm mirror might be observed in rotating mirrors.

Thought: —

A little microscopic red-hot point vibrated by diaphragm could be enlarged by reflection.

Thought: —

A constant vibration in a direction at right angles to the vibration of the telephone diaphragm could be compounded with it, and thus produce a resultant curve that could be magnified.

74

Eye spectacles for compounding vibration Thought: —

Would a vertical vibration observed by one eye, and a horizontal vibration observed by the other, be compounded IN SENSATION. If so a beautiful method of analyzing, or observing, vibrations might be founded on this: — Eye spectacles for seeing vibrations: — Telephonic eye-glasses.

Suppose you had an opaque screen with a mere pin-hole in it. Provide (a) for the right eye, and the other (b) for the left eye. Now let the screen (a) be vibrated vertically as shown by the arrow-heads below the diagram, and let (b) be vibrated horizontally, as shown. Then, would we not, in looking through the pin-holes at a distant screen, or wall, perceive a figure resembling the resultant of the two vibrations: — Perceive, for example, a figure 8; or some of the other well known forms resulting from the compounding of pendular vibrations at right angles to one another.

An electro-magnet, with vibrating armature could be used to produce a regular continuous vibration of one screen, and a telephone diaphragm, actuated by the voice of a speaker, could be used to operate the other.

75

Thought: —

Pin-holes would not produce the effect. What we want are slits. If we have two opaque screens superposed one in front of the other, and in one of the screens have a vertical slit and in the other a horizontal then light can only pass through at the point of intersection of the two slits, so that, if you view an illuminated white surface through the screens, you see only a small hole, not a slit; an effect very similar to that produced by a card with a pin-hole in it. In this case, however, the pin-hole effect results from the point of intersection of the two slits.

Now, if we keep the opaque screen with the vertical slit quite still, and move the card with the horizontal slit up and down, the point of intersection of the two slits will move up and down, so that an effect will be produced upon the eye of a bright spot vibrating vertically.

Keeping the horizontal slit stationary, and moving the card with the vertical slit from side to side, the effect produced will be that of a bright spot vibrating from side to side horizontally.

If now, both cards be vibrated simultaneously, the one with the vertical slit being moved from side to side, and the one with the horizontal slit being moved up and down, then we have produced the well known resultant figures of vibrations compounded at right angles with one another. The bright point 76 may appear to be moving round in a circle; or may produce the figure 8, or any of the other well known forms.

Now, it really would be a most interesting experiment to ascertain whether a similar effect would be produced by viewing each screen with one eye; instead of superposing both screens and observing the points of intersection

Look at a white wall at a distance with one eye, and hold at some distance from the eye an opaque screen containing a vertical slip, so that you could only see a white line instead of the wall. Now move the screen horizontally from side to side, and then — through persistance of vision — you will see the whole wall as it were through a shadowy haze. The vibrating screen will appear transparent, or semi-transparent.

Now, look at the wall with the other eye, and interpose at some considerable distance from the eye (the same distance as before) an opaque screen with a horizontal slit in it, so that with that eye you can only see a horizontal white line, instead of the whole wall. Now vibrate that screen up and down, and it will assume a shadowy appearance through which you can see the whole wall.

77

QUERY: — What effect would be produced by using both eyes simultaneously?

I cannot escape the conviction that we would see a resultant figure in white upon a shadowy ground, enlarged enormously upon the wall.

Those points on the wall that could only be seen by one eye would appear in a shadowy manner, covered with a haze. But those points that, at any point of time, could be seen simultaneously by both eyes, would appear white, without any haze. Thus, we should see the point of intersection of the two slits (at any point of time) in white upon the wall as a white speck. In successive points of time the white specks should appear in different places, and, by persistance of vision, would assume the aspect of a continuous line, and the resultant of the two vibrations should be perceived, as an enlarged figure upon the wall, as if drawn in chalk.

Should such an effect be produced, it would be a most extraordinary circumstance, because the image, or resultant vibration perceived in this case, would be SUBJECTIVE ALONE; whereas in the case of the superposed screens it was objective. This would be an optical illusion of a very interesting character, and an experiment could very easily be made to test the idea.

Coat a sheet of glass with paint, and scratch a fine line through the opaque coating. Take two scratched plates and vibrate at right angles one in front of each eye. The same effect should be produced IN SENSATION as though the plates were superposed with light coming only through the 78 intersection of the lines: — + Excepting that the resulting figure should appear MAGNIFIED upon the wall or screen — and the further away the wall, or object looked at — the greater should be the apparent enlargement.

Thought: —

The idea could be simply tested, by means of rods or wires clamped at one end and free to vibrate at the other. The screens could be attached to the rods, and the rods could be set in vibration by plucking them with the finger. They would soon come to rest, but the vibrations would persist long enough to test the point whether a subjective resultant image would be produced.

Perhaps the effect may be tested in a still more simple manner by a sort of converse process, in which the resultant figure should appear dark on a light ground instead of light on a dark ground

79

When a wire clamped at one end and free at the other, is thrown into vibration, the vibrating area is visible as a shadowy space, and if two wires are vibrated at right angles to one another, as shown in the following diagram: —

The points of intersection of the two wires are darker than the rest of the shadowy space and a resultant figure, like the figure 8, for example appears in that space in black.

Now if a wire is simply vibrated in front of each eye should not a subjective resultant be perceived upon looking at a distant illuminated wall. The resultant figure in this case should appear in black as though drawn in charcoal upon the wall.

80

This might originate a new and beautiful method of studying composite vibrations. The subjective resultant, however, could only be observed by one person at a time. It would be a wonderful thing if we could exhibit the effect to a whole audience at once.

I have been much struck by the fact that the subjective effect of stereoscopic projection can be perceived when the stereoscopic images are superposed upon a screen by a magic lantern in different colors: — For example, one of the images in red and the other in blue. A person looking at the screen perceives only a somewhat blurred picture, as though a photograph had been taken with the camera improperly focused.

But, when we view the screen through colored glasses — one eye looking through red glass and the other through blue — so that one eye sees only the red image on the screen and the other only the blue one — then the full stereoscopic effect is produced, and we seem to see the picture on the screen in space of three dimensions instead of two. We no longer see a flat picture, but a living scene.

Thought' —

Suppose a very narrow horizontal line of red light to be projected upon a screen. (Coat a sheet of red glass with opaque material, or varnish, and scratch a line through the varnish) Place this plate of glass in front of a lantern, and we will then have projected upon the screen the desired horizontal red line.

81

Now let the sheet of glass be vibrated up and down in front of the lantern with great rapidity, then — through persistance of vision — the whole screen would appear suffuse with red light, and no line would be visible.

In a similar manner coat a sheet of blue glass with opaque varnish, and scratch a line through the varnish, and place the blue glass in front of another lantern by whose means a vertical blue line would be projected upon our screen, then if the blue glass should be vibrated horizontally from side to side in front of its lantern with great rapidity, the vertical blue line upon the screen would disappear, and the whole screen would appear to be colored blue.

Now, if both lanterns are used simultaneously so that a horizontal red line should be projected on the same screen with the vertical blue line, then, if both colored glasses are at rest, we should see upon the screen a cross, the horizontal line being red, the vertical line being blue, and the point of intersection of the two of the resultant color — I think purple.

Now, if both colored glasses are vibrated in front of their respective lanterns, the red glass vertically and the blue glass horizontally, the screen should appear to be suffused with the resultant color — purple. That is, we should simply see a blank screen of a purplish color.

What would be the effect of viewing the screen through colored glasses — one eye looking through red glass, the other through blue — then both eyes would only see simultaneously the points of intersection for the time being of the red and blue lines on the screen, so that these points would be 82 more vividly perceived than other points which were seen only by one eye at a time. Only at the points of intersection would both eyes perceive an effect AT THE SAME TIME. Hence I should anticipate that a resultant vibration figure should appear upon the screen in the resultant color — purple.

Thought: —

Not so sure that the colored glasses would be necessary. I mean the colored spectacles applied to the eyes. Inclined to think that the vertical vibration of the red line would produce simply a uniform diffusion of red light over the screen: That the horizontal vibration of the vertical blue line by itself would produce a general suffusion of blue, and that the vibration of both colored glasses simultaneously in front of their respective lanterns would produce a light purplish tinge over the whole screen, with a resultant figure in deep purple on the screen. Inclined to think that this would be visible to the whole audience without the use of glasses.

QUERY: —

Would this image be subjective or objective?

A. G. B.

83

(Copied from press copy book) 1901, August 10 Sat. At B.B.

I received a telegram from Halifax, N.S., dated August 5, 1901, to the following effect: —

“Prof. Alexander Graham Bell, Baddeck.

The New York Herald, which I represent in Nova Scotia, asks me to see you, and get an interview on Santos-Dumant's achievements, and subject of aeronautics generally. It is impossible for me to leave Halifax just now owing to pressing duties on Halifax Herald. It would be very great favor indeed if you would write your ideas on the subjects named, giving 2,000 or 4,000 words. The large article preferred and mail it to me soon. It is exceedingly important to me to get this from you. I refer you to Hon. David, or Miss McCurdy. Please inform me by wire, collect, and oblige.

W. R. McCurdy.” (William Russell McCurdy).

To this I replied: — “Baddeck, Aug. 6, 1901

Mr. W. R. McCurdy, Halifax Herald, Halifax, N.S.

Telegram just received, cannot undertake to write anything. Glad to see you if you come here.

Graham Bell”.

Yesterday I received another telegram from Mr. McCurdy, dated Halifax, August 9, to the following effect: —

“Accepting your kind intimation that you would see me if I would go to Baddeck, I purpose Saturday morning for Baddeck.

W. R. McCurdy”.

Mr. W. R. McCurdy will therefore be here this evening, and it might be well to look over the subject and see what I am going to say to him about Mr. Santos-Dumont's experiments and upon aeronautics generally.

84

(Copied from press copy book original having been cut out and used. B.A.S.)

The first thing he will probably ask me, will be: —

“What do I think of Santo-Dumont's achievements?” and what shall I reply.

Well, I think there is no doubt that Mr. Santos-Dumont has made a notable advance and deserves all the success he has attained. What constitutes his success? It is chiefly the application of a greater propelling power to a smaller and narrower balloon than h? been

used before resulting in a greater velocity of propulsion. It is stated in the New York Herald that the engine

No use dictating until I have my material in shape, so will simply put down a few quotations I may want to refer to.

Quotations from “A System of Aeronautics” by John Wise, Aeronaut, Philadelphia, 1850.

Roger Bacon's idea of a balloon (13th Century)

Wise, p. 20, gives some account of Roger Bacon's ideas (and eminent philosopher of the 13th Century). Roger Bacon, he says, assumes that the atmosphere is a material of some consistency, capable of bearing upon its surface vessels, like ships are bourne upon the surface of the water. He quotes Roger Bacon as saying that his aerial machine

“must be a large hollow globe of copper, or other suitable metal, wrought extremely thin, in order to have it as light as possible. It must then be filled with etherial air or liquid fire and then launched from some elevated point into the atmosphere, where it will float like a vessel on the water.” (Wise p. 20)

Bounding over the ground, one hundred yards at a bound, with a ballasted balloon heavier than the air.

Wise says, p. 22, if we take a balloon of limited size about eighteen feet in diameter each way, it will, when inflated with hydrogen gas be capable of raising 160 lbs. independent 85 of its own weight. Now if this be so fastened to a man's body, as not to interfere with the free use of his arms and legs, he may then ballast himself so as to be a trifle heavier than the upward tendency of the balloon which will be nearly in equilibrio. He will then be able to “bound against the earth with his feet, so as to make at least a hundred yards at each bound”. He continues: —

“This the writer has often done, in the direction of a gentle wind, with the aid of his feet alone after his balloon had descended to the earth; and, on one occasion traversed a pine forest of several miles in extent, by bounding against the tops of the trees. Such a contrivance would be of inestimable value to exploring expeditions. Landings to otherwise inaccessible mountains; escapes from surrounding icebergs; explorations of volcanic craters; traversing vast swamps and morasses; walking over lakes and seas; bounding over isthmuses, straits, and promontories, or exploring the cloud capped peaks of Chimboroazo, could thus all be easily accomplished.” (A System of Aeronautics, by Jno. Wise, Aeronaut, Phil., 1850, p. 22).

Sub-heading Bishop Wilkins quotations about a ship floating upon the surface of the atmosphere & navigating the air, which probably originated the expression “aerial navigation”

Wise, p. 23, quotes from John Wilkins, Lord Bishop of Chester, who died in the year 1672. The quotation is from a work entitled “The Discovery of the New World”. Bishop Wilkins is quoted as saying: —

It is a pretty notion to this purpose, mentioned by Albertus de Saxonia, and out of him by Francis Mendoca, that the air in some part of it is navigable; and that, upon this static principle, any iron or brass vessel (suppose a kettle), whose substance is much heavier than that of water, yet being filled with air it will swim upon it and not sink. So, suppose a cup or wooden vessel, upon the outward borders of the atmosphere, the capacity of it being filled with fire, or rather etherial air, it must necessarily, upon the same ground, remain there, and of itself no more fall than an empty ship can sink.”

(Wise p. 23).

A.G.B.

1901, August 12 Monday At B.B.

In order to realize the condition of the public mind before the invention of the balloon, it would be well to remember that the barometer was not invented until 1642, and the air-pump not known until 1672. For hundreds of years it had simply been known that the material of which the atmosphere is composed had some consistency, for wind could be felt, like a current of water, and, of course, the great force of the wind, during hurricanes, was a matter of common observation.

So it was assumed that over the ocean of water lay another ocean of air. It was not known or realized that the density or pressure of the air diminished as we went up, so it was assumed that the atmosphere had an upper limit, or surface, on which floated the clouds, as wood would float upon water, and that above the ocean of air was an etherial atmosphere extending indefinitely upwards.

Roger Bacon, in the 13th Century,

So we had an ocean of water, and resting upon its surface an ocean of air, and resting upon the surface of the ocean of air, an etherial atmosphere extending indefinitely upwards. It was known that hollow vessels of considerable weight, in the shape of boats or ships, if filled with air, would float upon the surface of the water, and it was assumed that similar vessels, if filled with etherial air, would float upon the surface of the ordinary atmosphere.

How far up the atmosphere extended was unknown, but it was a familiar fact of observation

The ordinary atmosphere was supposed to extend upward at least as far as the clouds, which were supposed to float in the air at or about its upper surface.

Above the ocean, t T he atmosphere was assumed to cover the land and the sea to a certain, but unknown depth, and the clouds were supposed to be floating at or near the upper surface of the air. Above the air an etherial atmosphere existed, extending indefinitely upwards into space. As ships could sail upon the surface of the sea, propelled by the wind, so it was thought, that vessels might be made which should float upon the surface of the air, and be propelled by etherial winds.

How far up the ocean of air extended was not known, but the idea prevailed that the clouds were floating at or near its upper limit.

Roger Bacon, in the 13th Century imagined that if a large hollow globe of copper could be made, wrought extremely thin, so as to be as light as possible, and then be filled with etherial air, that it would float upon the surface of the air like a vessel upon water.

Bishop Wilkins, in the 17th Century expressed the idea as follows: — (See p. 23).

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An ocean of air which had an upper surface about the level of the clouds. Above this extended an etherial atmosphere. Hollow vessels, filled with air were known to float upon the surface of water — why then should they not float upon the surface of air if they could be filled with the etherial material.

Ideas commonly held before the invention of the balloon that prepared the world for Montogolfier's discovery.

Upon the ocean rested another ocean of air, and upon the air an etherial atmosphere extending upwards indefinitely into space. Hollow vessels filled with air were known to float upon the surface of the sea, why should not similar vessels filled with the etherial material float upon the surface of the air, and be propelled by etherial winds as ships upon the sea?

Thus originated the idea of aerial “navigation”, and although the conception itself has long disappeared, the term still persists although now inappropriate. A.G.B.

89

1901, Aug. 13 Tuesday At B.B.

Mr. W. R. McCurdy arrived here Sunday afternoon and took dinner with us. I gave him an interview after dinner on the veranda, so that my father could hear what went on. Bert was present too with special injunctions from Elsie and Mabel to see that I did not “give myself away”. Mr. McCurdy returned to Baddeck in the evening to write up the interview. He determined to wait till Tuesday morning so as to allow George McCurdy to make photographs of balloons from some of my books to be sent with the written account of the interview. Mr. Wm. Russell McCurdy came over here yesterday (Monday) afternoon to show me his manuscript and to have it typewritten by Miss Safford. We were all at work upon it up till four o'clock in the morning — Miss Safford too. George McCurdy too was over at the other side of the bay, making his paper prints by lamp light. All this notwithstanding the fact that we had a dancing party here last night, and I had to play for the dancers, so as to allow Susie McCurdy to perform upon the floor instead of upon the piano.

Present last night: Ladies: Mrs. Melville Bell, Mrs. Graham Bell, Miss Susie Stairs, Miss Susie McCurdy, Mrs. Gilbert Grosvenor, Miss Graham Bell, Miss Lina McCurdy, Miss Safford. Gentlemen: — Mr. Melville Bell, Mr. Graham Bell, Mr. Wm. Russell McCurdy, Mr. Allan Duffus, Mr. Gilbert Grosvenor? Mr. Edwin Grosvenor, Mr. George McCurdy, Mr. Douglass McCurdy? Mr. Lucian McCurdy.

We have omitted the name of Miss Roberta Ker, but this is perhaps excusable as she was rarely visible during the

STANDARD HARGRAVE KITE WITH RUDDER

As used with Experiments August 10, 1901.

(See p. 90)

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evening, but spent most of her time on the sofa behind the big table, or in some dark corner of the veranda!

Mr. W. R. McCurdy lay down on the verandah to rest for an hour and I followed called him at five o'clock this morning. We walked down to the warehouse wharf and stole a boat. Mr. McCurdy rowed himself across the bay to the McCurdy cottage — got a set of photographs from George — walked up to Baddeck, and caught the steamer for Grand Narrows leaving at seven o'clock this morning. I append to this dictation a carbon copy of the interview, with list of U. S. patents, and copies of the photographs forwarded to the New York Herald.

As we are all tired I shall simply make an allusion illusion to a very important experiment made at the Laboratory on Saturday, August 10, 1901, and leave it to be expanded another day. I allude to the successful result of attaching a rudder to the Standard Hargrave Kite, and working the rudder by means of two strings which made their exit from the kite at the place where the ordinary flying cord is usually attached, viz: — The center of the front cell.

The wind was very light. In the first experiment the kite was flown by a thick flying cord to take off the strain and the rudder manipulated by two lighter cords

RESULT: — The kite flew steadily and seemed to answer its 91 and answered its helm well, but the wind was so light that we could not operate the tail without practically flying the kite by the rudder strings alone. The flying cord remaining slack and in the way, we therefore removed the flying cord altogether and flew the kite by the rudder cords alone: —

In above diagram I have attempted to give a birds-eye view from above — of the results of the experiment.

The form of rudder used in Saturday's experiments was rectangular — the rudder forming a rectangular parallelogram.

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The rudder cord being attached to the central edge of the rudder, and being carried from there to the lower corner of the kite — there was a tendency when this cord was pulled to distort the rudder as shown by the dotted lines in the second diagram above. In order to remedy this defect I instructed Mr. Ferguson to use triangular rudders, and attach such rudders to all of our larger kites.

The kites were ready for trial yesterday afternoon (Monday, August 12, 1901) but our experiments were interrupted by the arrival of visitors. Mr. W. R. McCurdy arrived by boat driving down from the warehouse, and Mr. Percy Blanchard drove round the bay to introduce Mr. McFee of Halifax. We were only able to try what may be termed preliminary experiments. The Standard Hargrave flew very unsteadily, even when the rudder was not touched, and it was so sensitive to the helm that a mere touch to one side or the other sent it off to the right or the left with such a sudden dive that we were afraid to continue the experiment for fear of injuring the kite

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The triangular form proved to be much more steady, but still the kite moved from side to side a good deal. It also was very sensitive to the helm, and showed a tendency to dive.

We also tried the large red two-celled Hargrave kite. There was not enough wind to sustain it properly. It went up well when we ran with the string, and was very steady in the air while it remained up, but, as there was not wind enough to sustain it properly, we did not think it worth while experimenting with the rudder, more especially as our visitors had arrived and were waiting for us I should say that in this case the rudder was oblong, almost square.

The rudder was prepared for experiment on Saturday, but not then tried. The steadiness of its flight while in the air raises the suspicion in the mind that the unsteadiness of the other kites might perhaps have been due to the triangular form of the rudder. It is worthy of observation, however, that the wind came from the east of north, so that it blew down hill, and we probably had a slightly down draft to contend with. This however, should have affected all of the kites equally, and certainly the red Hargrave with the oblong or nearly square tail was very much steadier than the other two kites fitted with triangular eudders. A.G.B.

128

1901, Aug. 14 Wednesday At B.B.

Where the great humidity accompanying the hot spell 9 July 1901.

When the barometer is high over the ocean and low over the land there will be a tendency for damp air to pass from the ocean on to the land, so that the humidity of the air over the land should be increased. When the barometer is high over the land and low over the ocean there will be a tendency for the surface air over the land to flow towards the sea and the humidity over the land should be diminished.

The July weather maps show that all during the recent hot spell the barometer has been high on the two oceans and low in the interior of the continent. Might this not explain the great humidity attending the hot spell.

George McCurdy's photographs of kites in the air failed to show the string. Why not use red tape when kites are flown to be photographed. George McCurdy suggests that red string or cord would be better.

The kites that have been fitted with rudders have flown too far off the wind to support themselves, and this has been largely due to the fact that the rudders are not limited in their motion. I suggested yesterday to Mr. Ferguson that we should limit the motion so

that the rudders could only be turned to a certain limited extent to either side. I find this morning that he has limited the motion of the rudders by strings attached to the side of the kite.

This plan worked well. The large red two celled Hargrave Kite answered its helm well this afternoon without coming down. A.G.B.

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1901, August 15 Thursday At B.B.

FIRST PHOTOGRAPHS TAKEN BY MR. GEORGE MCCURDY At Beinn Bhreagh Laboratory August 6, 1901.

130

1901, August 16 Friday At B.B.

On Wednesday, August 14, we tried the four-celled Hargrave 50 × 25 × 25; over 200 long. Well braced on sides, top and bottom. The whole structure feels solid. Can rely on its keeping its shape.

Figure I will give an idea of the cross-bracing, which are made of sticks of very slight diameter, on the principle that a multitude of very slight sticks will be better than an equivalent weight in thick sticks. For example: Take a stick having a cross section of 1 sq. cm. This could be sawn into four sticks of ½ cm. sq. or into 16 sticks of ¼ cm. sq. So that 16¼ cm. sticks would weigh no more than a 1 cm. stick, and they could be used to brace the kite in 16 different places, whereas the thicker sticks would only brace it in one. The kite flew unsteadily from side to side with broadside down, as in Fig. 2, but very steadily when flown edgeways as in Fig. 3; proved, however 131 to be rather heavy for the wind, so that we could not try flying off the wind.

1901, Aug. 14, Wed.: —

Also tried the white Standard Hargrave Kite with square rudder. With rudder in the center the kite flew beautifully and steadily. On pulling left hand cord, rudder turned to the left, and whole kite went to the left of the wind the motion of the rudder had been limited by a string, after Mr. Ferguson's method. It went too far to the left, however, and seemed inclined to come down. Tried to save it by pulling on the right rudder cord to reverse the rudder, but that cord broke, leaving kite flying by left rudder cord alone. The kite then made a complete left-handed turn in the air and flew round and round in a circle, falling gradually. In order to save the kite as much as possible the whole line was let go, but too late — the kite came to the ground with considerable force, and — SMASHED.

1901, Aug. 14, Wed.: — Also tried the big red two-celled Hargrave Kite with square rudder, limited by strings as shown on next page in dotted lines, cords for 132 working the rudder in heavy lines

The rudder was limited by strings to a motion of fifteen degrees on either side of the central position, making the extreme angle between the two positions of the rudder 30°.

On reference to the Laboratory Note Book I find that this angle refers to the rudder on the White Hargrave Kite, described above, which was smashed. The rudder of the Hargrave Kite we are considering had much greater liberty of motion “30 or 40° on either side of the central position”. This proved to be too much.

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The kite was flown by the rudder ropes — went up well — On pulling on the left rudder rope kite went off to the left so far that it was evident it would fall unless the rudder could be turned. Could not pull the rudder back in time to save a fall. This kite too — SMASHED.

The following general results were established by the experiments of Wed., Aug. 14, 1901.

1. By the action of a rudder we can make a kite fly off the wind as desired.

2. The rudder must be limited to a very slight angle of motion to prevent the kite from flying so far off the wind as to come down.

3. During the experimental stage it will be advisable to use a special flying cord, so as to take all strain off the rudder cords. Then in case of an emergency we can leave both rudder cords slack, and save the kite by allowing it to fly by the flying cord alone, trusting to the force of the wind to place the rudder in the central position.

1901, Aug. 15, Thurs.; — Standard Hargrave Kite repaired and tried again in a good breeze. Seems to fly well on long string, but sways considerably from side to side on short string. Tried to fly it however, on a short string in order that George McCurdy might photograph it in the air. Before he could take the photograph it was struck by a squall — dived to the ground, and was — SMASHED.

1901, Aug. 15, Thurs.; — Warned by this experience we did not venture to fly the large red Hargrave Kite by a short string. We used a stout flying-cord attached to the center of 134 the front cell. The rudder cords were attached to two reels of lighter string, and we reeled out enough line on the grass to ve perfectly sure that the rudder cords would not tighten when we flew the kite by the flying cord

Flown by the flying string alone (rudder strings being loose) the kite rose beautifully and flew perfectly steadily. The flying cord was then attached to a post in the ground, so that we had a tethered kite. Mr. Ferguson took charge of the right rudder string and I of the left; we reeled in these strings until we could bring a strain to bear upon the rudder. The rudder had been limited to an angular motion of 35°, which turned out upon measurement to be 14° to the right of the central position and 20° to the left. The left rudder string broke, so that we could not try turning the rudder to the left without bringing down the kite again. We marked on 135 the grass the direction the flying string assumed when the rudder was central, and its direction when the rudder was turned to the right (14°). The angle turned out to be 43°.

Thus, by turning the rudder 14° to the right, the flying cord pulled 43° to the right of the wind. It thus became obvious that a very slight motion of the rudder caused a great deviation in the direction of the pull of the string. It was encouraging to observe that even with this great departure from the normal direction — no less than 43° — THE KITE DID NOT COME DOWN. (This means the possibility of sailing a boat 43° up into the wind.)

The kite was then brought down and the left rudder string repaired. The rudder was limited to an extreme angular motion of 32° intended to be 16 15° on either side of the central position, but which seems to have been about 13° to the right and 19° to the left.

On turning the rudder to the right the kite flew off about 28° to the right and kept up. On turning the rudder to the left if flew off 43°+ to the left and began to dive. The kite made a complete left-handed turn in the air and our past experience led us to expect a smash, but we instantly released both rudder cords allowing the kite to fly by the flying cord alone. The rudder straightened under the action of the wind, the kite recovered itself, and flew as well as before. The whirling, however, had caused the rudder lines to be twisted around the flying line. In spite of this we found that we were able to work the rudder.

The experiment showed that the rudder, even in this case, 136 had too much liberty of motion, so we brought the kite down again, and limited the motion still more. In the above experiment the angular distance between the extreme positions of the rudder was 32°, and between the extreme positions of the flying cord 71°, as shown below.

The rudder was then limited to an extreme angular motion of 10°, (5° on either side of the central position). Flew well, and did not come down. With rudder to left kite flew 20° to left; with rudder to right, kite flew 20° to right.

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This was a very gratifying result, and it was made in the presence of the following witnesses: — Mr. A. Melville Bell, Mrs. A. Melville Bell, Mrs. A. Graham Bell, A. Graham

Bell, Miss Safford, Mr. George McCurdy, Mr. Ferguson, and a party of strangers from the States, Mr. R. Brown (Robert Brown of Boston) and Mr. and Mrs. Armstrong, and their driver — name unknown, probably did not see the experiment as all we could see of him were his legs. He seemed to be asleep.

The experiments have satisfied me that we can control — from a boat — a rudder attached to the propelling kite so as to cause the kite to fly off the wind to the left or the right as desired — at a considerable angle — WITHOUT BRINGING THE KITE DOWN.

The next thing will be — TO DO IT. A.G.B.

138

1901, August 17 Saturday Recd. At Beinn Bhreagh

139 140 141 142

A few thoughts concerning the excessive humidity accompanying the recent hot wave.

If the earth's surface was composed of water we should have an atmosphere of aqueous vapor resting on the surface of the ocean extending upwards to a certain height

Now suppose a large land mass breaking up the water surface of the world. The water-vapor atmosphere will be fully formed over the ocean, and poorly formed over the land, excepting so far as water-vapor from the ocean may find its way over the land. Under normal circumstances the water vapor 143 pressure over the interior surface of the land will be very much less than that over the ocean, because — there is very little water there to be evaporated. There will therefore be a constant tendency of water-vapor to move from the ocean over the land tending, by diffusion, and gravity, to produce the condition shown in Fig. 1. If the air were quiescent water-vapor winds would blow — slowly, of course — from the ocean on to the land until in process progress of time a uniform water-vapor atmosphere would extend all over the world.

But, the air is rarely, if ever, quiescent. So while the tendency to diffusion exists, the actual diffusion must be profoyndly modified by the motion of the air. If the surface winds should blow from the ocean on to the land, this would favor the formation of a water-vapor atmosphere over the land. If, on the other hand, the surface winds should blow from the land towards the ocean, this would counteract the tendency of the water-vapor atmosphere covering the ocean to extend ing itself over the land.

If the atmospheric pressure is greater over the ocean than the land, then there will be a transferance of air (at the surface) from the ocean on to the land — squeezed out below on account of the superior pressure over the ocean.

So, a high barometer over the ocean and a low barometer over the land is favorable to the production of winds from the ocean towards the land carrying over the land the aqueous vapor that otherwise that would diffuse very slowly. Thus an aqueous vapor atmosphere would gradually form on the land and if the high pressure over the ocean and the low pressure 144 over the land should continue for a long period of time — as it did during the recent hot spell — the land water-vapor atmosphere would gradually accumulate and become deeper and denser.

Under these circumstances if the land area should be very much more heated than the ocean surface (which was the case during the hot spell) the water-vapor would not condense on the land, but remain as a gas in the air.

The column of air over the land being heated expands and bulging up above the level of the cooler ocean air above overflows above towards the ocean. The air circulation would be somewhat as follows: —

On the surface air moves from the ocean on to the land carrying water-vapor with it. On the land the mixture is heated, the air ascending, and the water-vapor not condensing but remaining on the land at the bottom in the shape of vapor.

In the upper strata of the atmosphere, air will move from the land over the ocean, but will not there carry off 145 the water-vapor because the water-vapor exists as an atmosphere with its base upon the land, and can only extend upwards a certain distance into the air — a distance dependent upon the water vapor pressure at the bottom, and upon its temperature. Certainly the proportion of water-vapor in the air will be very much less in the higher strata of the atmosphere than in the lower, and will be imperceptible at a certain height in the atmosphere under any circumstances. Air above that height moving outward from the land towards the sea, will carry little or no water-vapor away.

So that we have the following conditions: — No water-vapor removed by condensation over the land; (2) No water-vapor removed from over the land by the outward motion of the air in the upper strata of the atmosphere; (3) Water-vapor constantly brought by the surface winds from the ocean on to the land.

As long as these conditions persist there should be a constant accumulation of invisible water-vapor over the heated land, the water-vapor atmosphere there constantly growing deeper and thicker; the water-vapor pressure over the land constantly increasing; the dew-point temperature over the land constantly rising — the humidity increasing.

The extent to which the humidity increases, will depend upon the length of time these conditions last. In the case of the recent hot spell, I find from the weather maps, that during the greater part of July, 1901, a heated continent with high barometric pressure on both the oceans and low pressure in the interior of the continent existed, with surface winds 146 blowing from the Gulf of Mexico up the Mississippi Valley, and from the Pacific Ocean in the neighborhood of British Columbia, Washington and Oregon eastward into the country.

This was substantially the condition during the whole period of the heated spell, reaching its climax on July 28, when a high area commenced to advance on to the continent from British Columbia. On July 29, for the first time for many, many days, a high barometer existed in the interior of the continent in the northwest and in the southeast, and the

Weather Bureau notes “1901, July 29, 8 A. M. After an unprecedented duration of forty days, the great drought and hot wave in the corn belt has been broken by thunder showers, which were quite general, and in many places heavy. They were accompanied by decided falls in temperature, and the appearance of a cool wave in the northwest this morning indicates that a further fall may be expected tonight and Tuesday in the states of the central west. In addition to the rains in the corn belt there were others in the northern tier of states from New England to the Dakotas, and also in portions of the West Gulf States.”

This proved to be the breakup of the hot spell. July 30, 1901, 8. A. M. high pressure extends across the whole continent from northwest to southeast, and the warm damp air appears to be flowing off from this ridge down the St. Lawrence Valley. July 31, 1901, still characterized by high pressure over the interior of the continent.

During the greater portion of the hot spell water-vapor was constantly being brought by the winds from the Gulf of Merico up the Mississippi Valley faovring the formation of a water-vapor atmosphere

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Glance a moment at Fig. 3, on p. 144; — My idea is that water-vapor is being constantly brought on to the land below by the surface winds, and not removed above by the upper winds, nor condensed in the form of rain. Hence the invisible water-vapor over the land should accumulate and accumulate, and if the conditions persisted long enough would reach ultimately the uniform diffusion shown in Fig. 1.

This it can hardly do upon a continent, though it may do so on a small island, but the water-vapor pressure on the land should constantly increase — the dew-point temperature would constantly rise.

The dew-point temperature and the water-vapor pressure are intimately related to one another — so that given the one we can calculate the other. I think it would be a good plan

to get accustomed mentally to consider dew-point temperature as indicating pressure, and picture to one's self when the dew-point temperature rises — an increase in the depth of the aqueous vapor atmosphere.

Query: — How about the dew-point temperatures during the recent hot spell? Think it would be well to ask the Weather Bureau for a series of maps during that period, showing lines of equal dew-point temperature.

Have Mr. Zable purchase a file of newspapers for the month of July, 1901, and cut out and paste in a scrap-book the references to the weather and to the deaths and prostrations due to the heat. Make a similar collection for the month of July, of one or two preceding years. A.G.B.

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1901, August 19 Monday Recd. at B.B.

149 150 151 152 153 154 155 156 157 158

Photographs received from George McCurdy occupy pages 148 to 157.

Am taking up the study of United States Patents relating to Aerial Locomotion.

Muzzi, 1844, only an illustration, not a description. Drawing seems to indicate a lenticular balloon — a balloon shaped like a double convex lense, with car attached.

Brewer, 1854 Only an illustration no letter press. His patent is for a balloon.

Sherman, 1861: — A balloon normally compressed: By varying the amount of compression balloon will rise or fall without loss of gas or ballast Means for compressing a balloon, and varying the pressure so as to permit of ascent or descent without expenditure of gas or ballast.

Library of Congress

Quinby, 1861: — Oscillating wings with valves opening on the up-stroke and closing on the down.

Crowell, 1862: — Propellers(pulling, not shoving), to act vertically or horizontally as desired: adjustable hollow wings, filled with gas to act as aeroplanes: Cone-shaped rudder.

Kinsella, 1862: — Rocke d t -shaped balloon propelled by jets of air driven out astern.

Shaw, 1863: — Flattened balloon, forced edgeways by propeller or other means. Planes of the flat sides vertical. Gas pumped out of balloon into reservoir of compressed gas upon the descent; and pumped into the balloon in order to 159 ascent, thus saving gas and ballast.

Connell, 1863: — Boat-shaped balloon sharp at bow and stern (which are attached to rigid posts carrying the car). Gas chamber for condensed gas, and means to pump gas into or out of the balloon. Propeller at front of car — rudder at stern.

Andrews, 1864: — Three cylindrical balloons pointed at each end placed side by side to be propelled by shifting the center of gravity. When ballast is thrown over aeronaut steps to the rear of the car, thus tilting up the bow. The balloon in rising then also makes horizontal headway. Then gas is let out and the aeronaut steps towards the front of the car, tipping down the bow. The balloon in falling then advances. It ascends and descends on an inclined plane — and having headway can be steered. Inventor filed Caveat in 1849 and 1850. In his specification he claims to have tried the balloon successfully 1863, September 4, but it is uncertain from the description whether or not there was a man on board.

Wright, 1864: — Boat-shaped balloon with a sharp bow and rounded or flat stern, fitting over a boat shaped car carrying propeller at stern. Motive power not mentioned.

The inventor says: — “I am aware that oval shaped balloons and balloons with propellers and rudders have been in use and have been the subjects of Letters Patent of the United States”.

Just & Koellner, 1865: — Aerial Locomotive form Balloon propelled by folding wings operated by caloric engine. Each wing consists of two flat surfaces hinged together — folding together when moved forwards opening when moved backwards — 160 a sort of duck's foot action — or rather like Besnier's wings.

Balloon seems to be sharp at bow, but not pointed, ends in sharp edge, not a point.

A number of folding wings on each side operate successively (not simultaneously) thus securing continuous propulsion (not intermittant). A.G.B.

161

1901, August 21 Tuesday At Beinn Bhreagh

I have just been arranging the unused historical material in the order of dates for the purpose of going on with my “Historical Notes in relation to the Teaching of Speech to the Deaf”. A great many items do not directly refer to the Deaf, but contain scattering information relating to persons — New York Alms House, &c., &c., Will here only note references having a direct bearing on the subject in hand and which might perhaps be included in Appendix matter.

1814, Jan. 4 Kimball to Cogswell

1815, May 22 Long article from Connecticut Mirror entitled “Asylum for the Deaf and Dumb”.

1816, Jan. 22 Helen Hall's letter to a deaf and dumb girl in Amer.

1816, March 13 Helen Hall to her brother in America

1816, March 23 Harriet Cogswell to Alice Cogswell

1816, June 15 James Hall to Dr. Cogswell

1816, July 1 From the Connecticut Mirror giving proceedings of the Connecticut Asylum. Meeting held June 24, 1816 Also remarks concerning the proposed Institution from the Albany Daily Advertiser. Quoted by Conn. Mirror.

1816, July 29 From the Conn. Mirror about the Edinburgh Institution

1816, Aug. 8 Gallaudet to Cogswell, written on Board the " Mary Augusta.

1816, Aug. 12 Conn. Mirror quotes from New York Commercial Advertiser.

1816, Aug. 20 Hartford Courant quotes from New York Evening Post a communication signed "Humanitas" concerning Clerc's arrival with Gallaudet.

1816, Aug. 26 Editorial from Connecticut Mirror about Clerc's and Gallaudet's arrival.

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1816, Aug. 26 Nathan Dillingham to Dr. Cogswell. Letter alludes to Boston movement and mentions Dr. Freeman.

1816, Sept. 4 Wm. Moor to Dr. Mason Cogswell

1816, Sept. 16 Connecticut Mirror quotes from Boston Recorded an article entitled Connecticut Asylum for the Deaf and Dumb.

1816, Oct. 14 E. D. Griffin to Mason Cogswell.

1816, Oct. 28 Connecticut Mirror quotes an article from the Conn. Journal entitled “Deaf and Dumb”, which contains an address by Laurent Clerc. Language imperfect containing corrections in the print. Also questions asked Clerc with his replies.

1816, Nov. 18 Conn. Mirror quotes article from Albany Daily Advertiser of November 12, entitled “The Deaf and Dumb”. It contains an address by Clerc with questions and answers.

1816, Nov. 25 Conn. Mirror quotes from Albany Daily Advertiser an article entitled “Deaf and Dumb”.

1816, Dec. 5 Editorial from New York Commercial Advertiser headed “Deaf and Dumb”, about meeting helf in Mayor's office November 4. Gives notice of adjourned meeting.

1816, Dec. 12 Article from New York Commercial Advertiser relating to adjourned meeting held December 7. Laurent Clerc and Gallaudet present. Address from Clerc Resolutions passed. Clerc's reply. Questions asked Clerc.

1816, Dec. 18 Gallaudet to Cogswell written from New Brunswick.

1816, Dec. 23 Conn. Mirror, article entitled “Deaf and Dumb”, directs attention to Laurent Clerc's address in Philadelphia “which will be found on the first page of our paper”. Also notice of thanksgiving dinner of The New England Society in Philadelphia Nov. 28 with toast proposed by Laurent Clerc

1817, Jan. 4 From Niles Weekly Register, Baltimore. Article entitled “Deaf and Dumb”. Refers to Clerc and also states that Braidwood was then in New York carrying on the instruction of the Deaf and Dumb. Important. The only reference yet found of contemporary date referring to Braidwood's New York School.

Library of Congress

1817, Jan. 14 Letter from Clerc to Cogswell.

1817, Jan. 17 Notice in Commercial Advertiser headed “Deaf and Dumb.” Giving account of adjournedmeeting of citizens of New York held January 14, 1817 in pursuance of former proceedings relative to instituting a school to teach the Deaf and Dumb. Committee appointed to draft a constitution for Society to instruct the Deaf and Dumb. Quote

1817, Jan. 18 From The Commercial Advertiser, New York. Report of the Committee on the Deaf and Dumb in New York appointed by the public meeting of citizens held 1816, Dec. 6. Signed by Stanford, Chairman, Ackerly, Sec. This should be quoted.

1817, March 6 Letter from Elias Boudinot to Dr. Cogswell.

1817, March 24 Article from Connecticut Mirror entitled “Deaf and Dumb Asylum” containing a prospectus of the Connecticut Asylum signed by Cogswell and Wadsworth on behalf of the Directors. The Prospectus is dated 1817, Mch. 21

1817, May 19 Advertisement published in the Connecticut Mirror entitled “ A Card” requesting the inhabitants of the town to suspend their visits to the school, signed by Wadsworth, Ely and Hudson, Committee.

1818, Jan. 27 Item from Hartford Courant giving statistics of Deaf and Dumb in Massachusetts.

1818, Feb. 17 A letter to Dr. Cogswell from Zanesville, unsigned, but Mrs. Pratt says “probably from Dr. Rhodes a student with Dr. Cogswell, who settled in Ohio.”

1818, May 7 Letter from Clerc to Cogswell.

1818, Aug. 29 Letter from Gallaudet to Cogswell.

1818, August — Article from the Christian Observer entitled “Expediency of Teaching the Deaf and Dumb to Articulate”

1818, Nov. 12 Letter from Elias Boudinot to Dr. Cogswell

1818, Dec. Article from the Christian Observer consisting of a reply to article published in August entitled “The Expediency of Teaching the Deaf and Dumb to Articulate.”

1819, May 15 Extract from third Report of the Hartford School. Important as containing the policy of the school. It also gives a statement of the methods of instruction employed and defines the attitude of the school towards articulation teaching. It contains statement that U. S. Congress had granted the Asylum 23,000 acres of land and contains a copy of an act passed by the General Assembly of the State of Conn. 1819, May 1 changing the name of the Institution from Connecticut Asylum to American Asylum.

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1820, Article from Christian Observer, entitled “Connecticut Asylum for the Deaf and Dumb”. Quotes freely from the Third Report. Argument against Articulation.

1820, Sept. 18 Letter from Gallaudet to Cogswell

1820, Nov. 13 Letter from Pomeroy to Cogswell

1821, Aug. 28 Letter from Ackerly to Cogswell, in which he refers to unfriendly disposition on the part of Hartford School.

1821, Oct. 15 Letter from Cogswell to Ackerly. This seems to be a rough draft of his reply to Ackerly's letter of August 28th with emendations and corrections.

1822, June 15 Letter from L. Hollock of Savannah, to Cogswell. This has no reference to the Deaf.

1834 An article from the North American Review entitled “Education of the Deaf and Dumb”. The author's name is not given but he is an able writer. The comments and explanations show careful study, and the opinions expressed exhibit partisanship. The article appears on pp. 307 to 357 inclusive of the North American Review, Vol. XXXVIII, 1834. Mrs. Pratt's notes give extracts from this article relating to De l'Epee and Sicard, Massieu and Clerc; Origin of the Hartford School, New York Institution and Pennsylvania Institution. The author is such a careful writer and is evidently so well informed that his statements of historical matters are probably to be trusted, although we do not know his name. Mr. Barnard wrote an article for the North American Review, but I have the impression that we identified his article, which proved to be different from this. I may be mistaken, however, in this. Whoever the author may have been this article appears to me to have been the ablest article on the general question of the education of the Deaf that appeared in America up to the time of its date — although I do not approve of the sentiments and opinions of the writer — The author should be identified so as to be given proper credit for his work.

I propose to look over these articles tonight and select some of them for publication in the October Review. We can 165 publish some of the most important and give a list of the others with a statement as to where they may be found under the heading “Miscellaneous Material relating to the early history of the Hartford and New York Schools”.

New York Herald for Sunday, August 18, 1901, contains my interview on Santos-Dumont with the exception of the historical part and photographs. It is illustrated by a picture of Beinn Bhreagh Hall and of myself. Over my head appears an imaginative picture of a flying machine by the New York Herald's artist. There is more in it than meets the eye.

The same issue of the New York Herald, Sunday, August 18, 1901, contains glowing accounts of the success of the Herald's new departure in communicating with vessels at sea by means of wireless telegraphy. Many of the telegrams sent to the steamer Lucania are reproduced and messages from the Lucania printed. It is therefore rather disconcerting

to find in the Transcript, of Saturday, August 17, the statement that none of the messages sent to the Lucania were understood.

Picking up wireless messages from Submarine Cables

If messages by wireless telegraphy can be received at sue distances as reported, viz: — sixty miles — why could it not be possible to take off messages from a submerged cable at any part of the Atlantic. The depth at which a cable lies submerged is nowhere greater than one or two miles. It certainly should be possible for a vessel passing over the submerged track of a cable to receive news all the way across the Atlantic — 166 but this requires invention.

I am at work upon the plan of a building for a Beinn Bhreagh Restaurant and lodging house.

Have also formulated some ideas concerning an apparatus to be constructed with aerial propellers and aerial rudder to be made and tried upon the waters of the Bras D'Or Lakes, but this dictation is already sufficiently long, and I must defer description to a later period. A.G.B.

Chapter VII of Historical Notes will prove to be a difficult chapter to write. Will not attempt to get it ready for the October number of the Review. I propose in that number to give only appendix material entitled “Miscellaneous Material Relating to the Early History of the Hartford and New York Schools”. In that I shall quote a few of the more important historical extracts and give a list of the remainder with references referring the reader to the places where the articles may be found and stating that they have been copied for preservation in the Volta Bureau. I will then go on and digest the material so as to give Chapter VII in the December number of the Review. A.G.B.

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1901, August 23 Friday At B.B.

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1901, August 24 Saturday At B.B. HISTORICAL MATTER RELATING TO THE EARLY HISTORY OF THE HARTFORD AND N. Y. SCHOOLS.

The following items appeared in the Association Review for April, 1901, pp. 130 to 140.

Appendix Q. Letter from Dr. Cogswell to Rev. Able Flint, 1811, June 18

Appendix R. Action of the General Association of Connecticut in response to the letter from Dr. Cogswell. (Farmington Meeting, June, 1811

Appendix S. Letter from Sylvester Gilbert to Dr. Cogswell, March 1812.

Appendix T. Article from the Connecticut Courant May 26 1812. (Written by a “Parent”.)

Appendix U. Sharon Meeting of the General Association of Connecticut, June, 1812.

Appendix V. Petition of Mason F. Cogswell, Ward Woodbridge, and others, May, 1816.

Appendix W. Letter from Sylvester Gilbert to Dr. Cogswell, 1816, July 18.

Appendix X. Sketch of the life of Sylvester Gilbert.

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The following additional material has been prepared for publication in the October number of the Association Review.

Appendix Y. Genealogical Record left by Judge Sylvester Gilbert, of Hebron, Connecticut.

Appendix Z. Dr. Stanford's Alms-house class, 1807, from Sommers Memoir of Stanford.

Appendix 2A Extracts from the Diary of the Rev. John Stanford

Appendix 2B Original subscriptions to defray Gallaudet's expenses in Europe, 1815, May 1.

Appendix 2C Public appeal in aid of the Hartford movement 1815, May 22, from the Conn. Mirror.

Appendix 2D Announcement of the organization of the Connecticut Asylum and republication of an article from the Albany Daily Advertiser relating to the Hartford movement, published in the Connecticut Mirror, 1816, July 1.

Appendix 2E Gallaudet to Cogswell from France, 1816, June 17.

Appendix 2F Gallaudet to Cogswell from New York 1816, Aug. 8 (afternoon).

Appendix 2G Gallaudet to Cogswell written on board the “Mary Augusta” 1816, Aug. 8 (evening)

Appendix 2H Editorial from the Conn. Mirror, congratulating the public on the arrival of Gallaudet and Clerc, in Hartford, Connecticut, 1816, Aug. 26.

Appendix 2I. Letter from Dillingham to Cogswell, alluding to a proposition to start a school in Boston, Mass. 1816, August 26

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Appendix 2J Letter from William Moore to Cogswell, in which he suggests changing the name from Connecticut Asylum to American Asylum. 1816, Sept. 4.

Appendix 2K Dr. Cogswell's letters to his wife in 1816 dated: — Sept. 7, Oct. 30, Nov. 4, Nov. 6, Nov. 10, Nov. 17, and Nov. 20 enclosing a note to his daughter Alice.

Appendix 2L Announcement of meeting held 1816, Nov. 4 to consider the propriety of establishing a school in New York City, from the N.Y. Commercial Advertiser, 1816, Dec. 5.

Appendix 2M Article from Niles Weekly Register, 1817, Jan. 4, showing that Braidwood was then in New York

Appendix 2N Letter from Laurent Clerc to Cogswell announcing the decision of the people of New York to establish a separate school. 1817, Jan. 14

Appendix 2O Announcement in New York Commercial Advertiser 1817, Jan. 17, 18 and 20.

Appendix 2P Report of the Comm. on the Deaf and Dumb in N. Y., from the Commercial Advertiser, 1817, Jan 18.

These titles demand revision and re-arrangement. A. G. B.

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1901, August 27 Tuesday At B.B.

Have been very busy for some days past getting my Historical Notes ready for the Review . Finally got them off to Mr. Booth last night.

Don't think I have noted the arrival at Beinn Bhreagh of Prof. and Mrs. Grosvenor “a week ago last Saturday” — haven't time to figure out the date. Then Mr. Hitz arrived with Helen Keller and Miss Sullivan last Wednesday.

At the present time we have with us the following visitors: — Mr. and Mrs. A. Melville Bell; Prof. and Mrs. Grosvenor; Mr. Edwin Grosvenor (don't think I have noted that Bert and Elsie are now occupying the Lodge); -Rebbie-Ker; Miss Roberta Ker; Miss Annie Sulliyan;

Miss Helen Keller; Hon. John Hitz. Total nine visitors. House pretty full. Mr. Hitz and Mr. Edwin Grosvenor room in the gardiner's cottage

While we are at it we may as well note the permanent residents here: Mr. and Mrs. A.G.B; Miss Marian H. Graham Bell, and Miss Bessie A. Safford — and at the Lodge Mr. and Mrs. Gilbert H. Grosvenor.

Kitchen department is big — by the by changes in the kitchen too — the kitchen range has been removed and a new and larger range put in. Men were at work upon it all night 172 for several nights. Two colored waiters here now; Charles Thompson and his cousin Arthus Clarkson. Maggie Campbell is out cook, and two chambermaids Mary Taylor and Sarah Morrison. Handiman Handy man , ready for anything that comes along — especially boats at the point and odds and ends of work here, is Malcomb McLeod, husband of one of our former maids Georgie. By the by another thing not noted, Mr. McInnis and his family have removed to the Ellis Cottage, and Mr. McInnis's house is now used as a lodging house for the men on the place in charge of Mrs. McLeod (wife of Malcomb).

All the young people here have been working hard for a long time past over an entertainment they proposed to give in Baddeck in aid of the Baddeck public library. The manager of the whole thing was Miss Marian H. Graham Bell. Performance came off in the Masonic Hall Baddeck, Friday evening, the 23rd inst. Great success in every way. The play especially “The Mousetrap” excellent.

Helen Keller attended the performance and seemed to enjoy it as much as anybody. I understand they raised nearly seventy five dollars for the library.

Last night Marian, Robbie, Miss Safford and Ed went to town in the rain to attend a dance given by summer tourists at the Telegraph House. No one seemed to want to go, but THEY WENT. They felt that they OUGHT to go out of compliment to the summer visitors,

but thought it would be sufficient to 173 remain for about an hour (they did not return until about two o'clock in the morning).

In going over in the boat, I understand, each one decided that he or she would not dance — didn't want to, didn't feel like it. But everyone of them danced continually until after one o'clock in the morning — from all which I conclude that they had A GOOD TIME.

Good gracious I had almost forgotten the event of the whole season

THE HARVEST HOME, which takes place this afternoon. I had nothing to do with the arrangements, so I had almost forgotten it. Edwin Grosvenor has had charge of the whole thing. I give here a copy of Edwin Grosvenor's programme which has been typewritten and posted up at the warehouse and other places.

The programme is as follows: We may as well preserve here Marian's programme for the Baddeck entertainment held last Friday, and Ed's programme for our Harvest Home.

The following pages give both programmes: — A.G.B.

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ENTERTAINMENT IN AID OF THE BADDECK PUBLIC LIBRARY MASONIC HALL, AUGUST 23, 1901.

PART 1.

I. Arcadian Dance

Misses McCurdy, McDougal, Marsh, McKeen

Messrs. D. McCurdy, Bethune, L. Mc Curdy, McDonald

Accompanist, Miss M. Tremaine

Herald, Miss McKay.

II. Song “Everybody Has A Whistle Like Me”

Miss S. Tremaine. Accompanist Miss M. Tremaine.

III. Recitation “Bobs” Master Rose MacKenzie

IV. Song “What Will you Take for Me?”

Misses Annie and Elsie Buchanan

V. Song and Dance “Piccaninnies”

Miss Ker, Mr. McKeen

Accompanists, Misses McKeen and McCurdy.

VI. Song (a) “The Slumber Boat”, (b) “An April Girl”.

Miss Buchanan, Accompanist, Miss S. McCurdy.

VII. Piano Solo “The Butterfly” Miss S. McCurdy

VIII. Song and Dance “Rhoda in her Pagoda” From San Toy

Misses Stairs, Marsh, MacRae, Ker, Buchanan, Tremaine

Accompanist, Miss S. McCurdy.

IX. Violin Solo “Air Varie” Miss Tweedie,

Accompanist, Miss S. McCurdy.

X. Song “The Swallow” Miss Buchanan,

Accompanist, Miss S. McCurdy.

(INTERMISSION).

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PART II.

PLAY “THE MOUSETRAP” W. D. HOWELLS

Mrs. Amy Somers, a young widow, Miss Graham Bell

Mrs. Bemis Miss Tremaine

Mrs. Curwen Miss S. McCurdy

Mrs. Miller Miss MacRae

Miss Agnes Roberts Miss L. Buchanan

Jane, the maid Miss Ker

and

Mr. Willis Campbell Mr. Edwin P. Grosvenor.

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SPORTS FOR THE HARVEST HOME

Held at Beinn Bhreagh On the Tennis Court (Above the Lodge) August 27, 1901, at 2 P. M.

PRIZES IN ALL EVENTS.

1. Running and standing jumps for distance.

2. Running high jump

3. 50 yard dash for men

5. Putting the shot

6. Potato race

7. Obstacle race; this will include sack race, crawling through a barrel, climbing a fence, &c.

8. Harnessing and unharnessing single team

9. 50 yard run for ladies

10. Relay race between mixed couples; ladies run first; men do not start until partners have come in

11. Shooting contest

12. Tub race; wash-tubs used for boats, hands as oars

13. Boat race (from Warehouse to the Lodge)

14. Swimming race; 50 yards.

DANCING IN THE EVENING AT THE WAREHOUSE.

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1901, Aug. 27 Wed At B.B.

FIGURE I.

FIGURE 2.

Helen Keller flying kites at Be?in B???yk

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FIGURE 3. Bringing down the kite

FIGURE 4. Bringing down the kite

Helen Keller flying kites at Be?in B???yk

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FIGURE 5.

FIGURE 6.

Helen Keller flying kites at Be?in B???yk

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FIGURE 7.

FIGURE 8.

Helen Keller flying kites at BB

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FIGURE 9.

FIGURE 10.

Helen Keller flying kites at BB

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FIGURE 11.

FIGURE 12.

Helen Keller flying kites at BB

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1901, August 28 Thursday At B.B.

The photographs, pp. 177 to 182 record Helen Keller's visit to the laboratory on Friday, Aug. 23, 1901.

We took the large red three-celled Triangular Double-Decker up to the field and let Helen fly it.

In Figure 1, p. 177, the kite is on the ground

In Figure 2, p. 177, the kite is in the air but not visible in the picture.

In Fig. 3, p. 178, Helen Keller has started to bring the kite down.

Fig. 4, she has almost reached the kite.

Figures 5 to 12, pp. 179 to 182 refer to experiments made with the new Hargrave kite, with a small rudder within the rear cell. It had a flying cord and two rudder lines.

In Figures 5, 6, 7, 8 and 11 the kite is not in the air because the flying cord is seen in the picture lying on the grass.

In Fig. 11 I am explaining something to Helen while she holds a reel in her hands.

In Fig. 9 the kite seems to be in the air, although not in the picture, nor can we make out the string. Helen is holding it.

In Fig. 10 the kite is flying in the air tethered to a peg in the ground, and Helen has her hand on the string noticing by that means the movements of the kite.

In Fig. 12, also, the kite is seen in the air.

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The following are Miss Saf ford's field notes: —

“1901, Aug. 23, Friday at B.B. Lab. Helen Keller came to Laboratory today. She held the kite string while the three-celled triangular kite was flown and took the kite down”.

“Wind-from S.W.

Experiment I. Two-celled red Hargrave new kite, rudder inside back cell

Each cell 100 × 30 × 30 cm.

Kite 120 cm. long

Rudder completely within the last cell

Rudder 27 × 10 cm.

Rudder limited to small angle as follows

Three lines — two rudder lines and one to hold kite

Flown middle of front cell — tethered.

RESULT: — It moves from side to side — then flies pretty steadily when flown from flying string alone.

Mr. Bell and Helen Now take left rudder string and Mr. Ferguson the right. Mr. F. Pulls right rudder string; Mr. Bell loosens left to see if it steers to the right — 185 turns only slightly to the right, but came up slightly into the wind — left rudder string broke, so had to stop experiment

Too late to do much today.

Helen brings down kite. B.A.S.”

The kite used in the above experiment is shown on p. 167 lower picture.

The kite first set up and illustrated in Figs. 1,2,3,4, pp. 177 and 178 is the one illustrated on p. 154 A.G.B.

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1901, August 30 Friday At B.B.

Steering a kite to right or left causes diving. The reason and the remedy.

Tried three new experiments yesterday. (1) Triangular rudder attached to three-celled triangular kite shown in lower picture on p. 152. The kite with rudder attached is shown in upper picture on p. 167.

The kite was flown from the inner edge of the front cell It answered its helm, but showed a tendency to dive, on each side. Rudder limited to extreme motion of less than 25°. Extreme angle of flight about 45° minus.

I noticed the cause of the diving tendency. When the kite went to the left it turned on its left side, when — the rudder still being to the left — steered it down

Of course when the kite is on its left side — that is when the left side is horizontal — then the rudder is down and steers the head of the kite down. There is a little confusion in the words right and left. In my use of the terms they always mean right and left OF THE OBSERVER. This really 187 would be the very opposite if applied to the kite. Suppose a fish to be swimming upright, and he should turn his tail to his right, (and in turning towards his right should turn over on his right side, then the tail would be bent downwards and steer the fish's head down. This is what the kite did, but from our point of view the rudder was turned to our left

Perhaps it might be well to speak of the rudder as being put to port or starboard, to avoid confusion of right and left or how would it do to put ourselves in the place of the kite — a and reverse our usual termnology.

However, my meaning is clear, that when the kite lay on its side the rudder was turned down and hence tended to steer the head of the kite down. In the case of our triangular kite the rudder was so limited in its motion that it did not succeed in steering the kite to the ground, it kept up in spite of the tendency to dive.

THOUGHT: — The kite should be so shaped that it cannot turn on its side, or: — THOUGHT : — When the rudder goes to our left let the kite turn No the phraseology won't do. Let us take the kite's right and left.

When the rudder is turned to the right, that is to starboard — let the kite turn over on its left side, then the rudder will be pointed up and will steer the kite UP and not down.

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(2) We tried yesterday the large red Hargrave kite with rudder as shown at the top of p. 148.

As we had noticed that the rudder strings where they passed through staples in the kite had become very much chaffed, we substituted wires for strings — two copper wires — of fine diameter. Outside the kite the wires were attached to pieces of wood to which stout cords were fastened.

RESULT: — Both copper wires snapped when the kite was in the air before we had an opportunity of observing the effect of the rudder.

(3) We tried yesterday the new red Hargrave kite with small rudder completely within the back cell — See lower picture on p. 167:

Kite unsteady — seemed to be distorted by the wind — needs bracing. The cloth has become loose and baggy. Could 189 not decide what effect. Miss Safford, in her field notes says:

"General Result: — We cannot trace relation of rudder to motion of kite — whole kite seems to be distorted under wind."

Another experiment was made with this kite which was more satisfactory than the last. The rudder was removed and two strings were attached on either side of the front cell in the middle part of the cell.

Kite flew with the wind when held by both strings; Flew to the left when held by right string and to left right when held by right left string. Extreme angle of flight about 50°.

Present: Mr. A. Melville Bell, Mr. Hitz, Helen Keller, Miss Safford, George McCurdy, Mr. Ferguson, and: — A.G.B.

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Kite rudder in yesterday's experiments arranged as shown below:

THOUGHT: If rudder should be placed upside down, as shown, would not this cause the kite to turn on its OTHER SIDE? That is — if first arrangement causes kite to turn on its right side when rudder turns to starboard, thus steering kite down — would not latter arrangement cause kite to turn on its left side when rudder goes to starboard, thus steering kite up. We have a rudder arranged in this way that has not yet been tried. A.G.B.

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MEMORANDUM.

Pages 191 to 199 inclusive, contain photographs relating to the Harvest Home.

END OF VOLUME.

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1901, August 31 Saturday At B.B.

The Harvest Home was held on August 27th, 1901. Seemed to be a success, although attendance not so large as on former occasions. Dance in the evening, however, was crowded. Miss Safford counted one hundred and twenty-five persons on the field where the sports were held, and she thinks there were probably more. If so we had about one half of the attendance on former occasions. I forget the number at the last meeting, but think there were over three hundred. However, we had a very pleasant time. All the people seemed to enjoy themselves. I don't know what time the dance broke up, but they seemed barely to have begun when I was there about mid-night.

Helen Keller gave the prizes. We are indebted to Edwin Grosvenor for the great success of the whole event.

The young people seem to have dancing parties all the time — or entertainments. Let me look back a few days. The entertainment for the Baddeck Public Library, August 23, Friday; Saturday they must have gone somewhere, I find no record of it. Monday August 26, dance at the Telegraph House; Tuesday, August 27, Harvest Home; Wednesday, dance at the Tremaines; Thursday, Eucher party at Miss Lina McCurdy's, and the Misses Buchanan here; two entertainments in one night; Friday, August 30 party at the Lodge in honor of the day — Prof. Grosvenor's birthday, and Bert and Elsie's engagement day. Tonight the Ladies Club of Baddeck is to meet here. Prof. and Mrs. F. A. Grosvenor, Miss Sullivan and Helen Keller. (Mrs. Grosvenor is President of a Ladies Club in Amherst of 200 members)

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The experiment suggested in yesterday's notes, p. 190 of reversing the rudder, was tried yesterday afternoon. Kite used, the three-called triangular kite shown lower picture of p. 152, but the side braces were removed in order to lighten the Kite. The rudder, as used in Thursday's experiments (see p. 186) is shown at top of p. 167.

Yesterday afternoon this rudder was turned upside down, just the reverse way from that shown p. 157

With this arrangement of rudder the kite answered its helm well and did not dive. Miss Safford says in her field notes: — “The kite follows helm and does not dive. The kite still has a tendency to turn on its side so as to have rudder turned downwards, but keeps much more on even keel than before”.

We also tried yesterday an experiment with a large red triangular three celled kite with two super-posed aeroplanes in each cell, with rudder arranged as in the last experiment — like

a ship's rudder upside down. Kite used in this experiment is shown in photograph on p. 154

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The rudder was limited to angle of about 16° — 8° on either side of the central position. Miss Safford's field notes are in shorthand, so I will ask her to copy them: —

“Steadiest kite we have had yet — flies steadily and rudder works beautifully”.

The kite was certainly perfectly steady and did not turn on its side when the rudder moved. As the wind began to fail we stopped the experiment.

End quotations here

This form of kite seems to possess great advantages. Have given Mr. Ferguson instructions to make another triangular three-celled kite on the same general plan as this with four superposed aeroplanes in each cell. The sides of each cell to be 175 cm. long and the top of the cell 100 cm. (See next page). Instead, therefore of having an angle of 60° at the keel, as in the equilateral forms, the keel angle of this triangular kite I calculate will be about 32°. This should give great stability to the kite and prevent it from turning on its side, while the four aeroplanes should give considerable lifting power. Width of cloth in each cell 25 cm. Aeroplanes 40 cm. apart. Length of kite 175 cm. Width of each cell 25 cm., spaces between cells 50 cm Mr. F. is now making this kite.

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I anticipate that this kite will be so stable in the air resisting any turning movement to cause it to go on its side, that it may be made the basis for rudders or attachments of all sorts — in order to test their effect. My only fear is that it may not be long enough to keep its length parallel to the wind. For such a purpose it seems to me advisable that a kite should be very long in proportion to its width. A plan of the body of this kite would form a square.